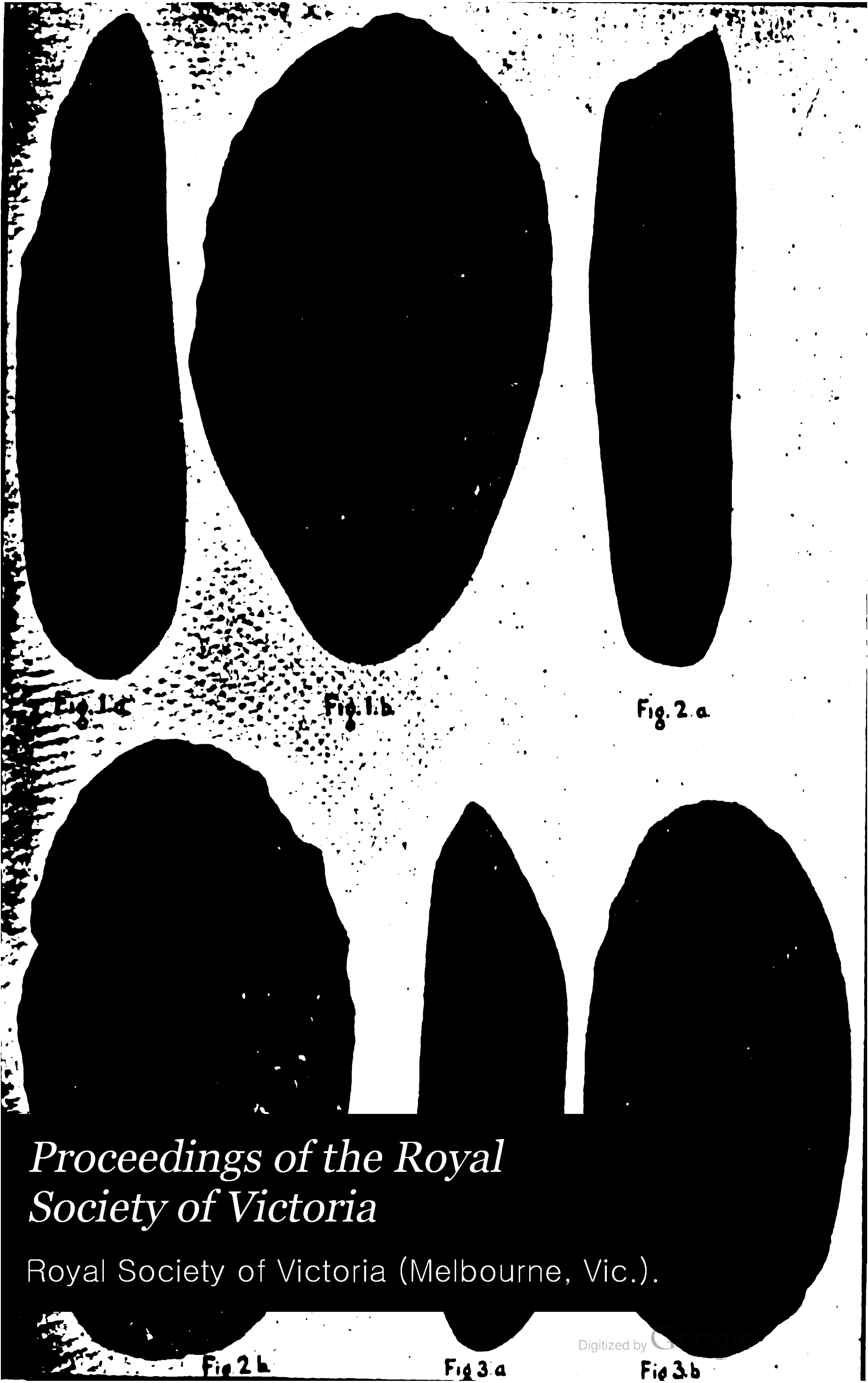
Fig. 1.a
Fig. 1.b
Fig. 2.a
Fig. 2 b
Fig 3.a
Fig 3.b

PROCEEDINGS

OF THE

Royal Society of Victoria.

VOL. XIII. (NEW SERIES).

PART I.

Edited under the Authority of the Council.

ISSUED AUGUST, 1900.

(Containing Papers read before the Society during the months of (April, May and June, 1900).

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CONTENTS OF VOLUME XIII.—PT. I.

Art. I.—*Further Descriptions of the Tertiary Polyzoa of Victoria.—Part IV.*

By C. M. MAPLESTONE.

(With Plates I. and II.)

[Read 19th April, 1900.]

Cellaria biaperta, n. sp. (Pl. I., Fig. 1).

Zooecia obscurely hexagonal, almost diamond-shaped, with linear margins which are sometimes straight longitudinally for a short distance between the zooecia; thyrostome semicircular, above the middle of the zooecia, two denticles in the lower margin; at the apex of the zooecia a somewhat semicircular opening (ovarian?); avicularia triangular, with rounded angles, cucullate, with a deep oval cavity.

Locality.—Muddy Creek (T. S. Hall).

A single zoarium. The zooecia are pointed at the distal and proximal ends; the semicircular opening which is present in almost every zooecium may, I think, be ovarian. It is allied to *C. laticella*, but the avicularium is different, and this feature is now recognised as the most distinctive characteristic in *Cellariae.*

Cellaria biseriata, n. sp. (Pl. I., Fig. 2).

Zoarium in flat internodes composed of two rows of zooecia on each face. Zooecia subtriangular; surface smooth; margins linear, raised; thyrostome close to distal end, semicircular; two denticles in lower lip; a small crescentic lobe projecting under the distal margin.

Locality.—Grice's Creek, Mornington (T. S. Hall).

A single specimen in good preservation. The zoarial and zooecial characters are very distinctive.

Membranipora spiculifera, n. sp. (Pl. I., Fig. 3).

Zoarium cylindrical, dichotomously branched. Zooecia oval, area large; margin narrow, raised, with a series of small mamillae, probably the bases of spines; ooecia globose, with subtriangular area in front.

Locality.—Mitchell River (J. Dennant).

This is near *M. geminata*, but it is much more delicate; the margins are not so thick as in that species and there is no trace of a "sloping plate" in the distal end of the zooecia.

Membranipora morningtoniensis, n. sp. (Pl. I., Fig. 4).

Zooecia oval; area very large; margin raised, with six (or more) irregularly branched spines at the distal end.

Locality.—Mornington (T. S. Hall).

I have found only the small fragment figured, in which there is but one zooecium at all perfect (a small portion of the margin on the left hand side is broken away), but the numerous irregularly shaped spines at the distal end show it to be quite distinct from any other species.

Membranipora dennanti, n. sp. (Pl. I., Fig. 5).

Zoarium encrusting. Zooecia irregularly oval; area subtriangular, or subquadrangular, with the angles rounded; avicularia large, mandible long, acute, slightly curved; a large perforation or open space above. Ooecia globose, with a faintly marked frontal area.

Locality.—Mitchell River (J. Dennant).

This belongs to the "*flemingii*" group. The perforation or uncovered space in the cell wall above the avicularium is a very peculiar feature, but is said by Mr. Waters[1] to occur in *M. curvirostris* and *M. permunita.*

Membranipora incurvata, n. sp. (Pl. I., Fig. 6).

Zoarium encrusting. Zooecia irregularly hexagonal, very flat, margins sulcate; area oval, large, surrounded by a narrow mamillated border, which incurves near the distal end.

Locality.—Fyansford (T. S. Hall).

The single specimen figured. The zooecia are large and very flat. The small elliptical prolongation of the area distally formed by the incurved margin is peculiar, and may possibly represent ooecia broken away, but there is no trace of an ooecial cell in the cavity, the dorsal wall is quite smooth internally.

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1 Linn. Soc. Journ., 1898, p. 684.

Amphiblestrum crassissimum, n. sp. (Pl. I., Fig. 7).

Zoarium very robust, somewhat glomerate. Zooecia with very thick cell walls, ovate; margins of area broad, raised, slightly concave on the surface; in the dorsal wall there is on each side a large perforation, and on the lower median portion a still larger one; 2·10 spines on distal margin.

Locality.—Filter Quarries (T. S. Hall).

This is a remarkably robust species, with thick smooth walls. It is quite distinct from any other. Some of the zooecia are truncate, with the distal and dorsal wall incurved, while others are not truncated, but have the distal margin convex, with traces of spines. In these the peculiar perforated structure of the dorsal wall is not seen, save in one (the extreme left hand one), in which one of the lateral perforations is visible, and in the lowest one in the figure, in addition to the thickened distal margin with spines, there is a semicircular structure with a row of spines or perforations, which probably represents the front of an ooecium, as, at the extreme proximal part, there is apparently the remains of the distal portion of a zooecium.

Amphiblestrum robustum, n. sp. (Pl. I., Fig. 8).

Zoarium cylindrical, branched dichotomously, robust. Zooecia large, oval, four in lateral series; surface smooth, a few spines round the margin.

Locality.—Filter Quarries (T. S. Hall).

This also is a very robust species. The margins probably bore spines all round, but the bases of a few only (in different positions) are preserved.

Amphiblestrum bispinosum, n. sp. (Pl. I., Fig. 9).

Zoarium in vincularia form, quadrate. Zooecia in single linear series on each of the four faces, very large, quadrate, elongate; area oval or subquadrate, opesia subquadrate, narrower at distal end; a large pore on each side of the margin, near the distal end; whole surface minutely granular.

Locality.—Mitchell River (J. Dennant).

This is a very large-celled species; the pore on each side of the opesia may represent either a small avicularium or, more probably, the base of a large spine.

Amphiblestrum concavum, n. sp. (Pl. I., Fig. 10.)

Zooecia of very irregular shape, from triangular to oblong; surface slightly concave, the marginal portion being raised, especially in the distal part, but not thickened in any way; opesia also irregular in form, oval to quadrate, margins slightly thickened; surface covered with minute granulations; narrow sulci between the zooecia; avicularia raised, oval, with triangular mandible, a bar and semicircular cavity.

Locality.—Mitchell River (J. Dennant).

A single specimen.

Pyripora catenularia, (Jameson, sp.)

In some material from Spring Creek I have found a specimen of this species. Mr. Waters records it from Curdie's Creek in Q.J.G.S., Vol. XXXVII., p. 323, under the name of *Membranipora catenularia.* Dr. MacGillivray in P.Z.V., dec. XI., gives reasons for retaining D'Orbigny's genus *Pyripora.* It is not included in the species described in his monograph.

Selenaria cribrosa, n. sp. (Pl. II., Fig. 11).

Zooecia irregularly hexagonal, with wide inwardly sloping margins; aperture arched above, sides and lower margin straight, edges crenulated; vibracular area very large, cribriform. Dorsal surface furrowed, very slightly granulated.

Locality.—Gippsland (Rev. A. W. Cresswell).

In the two specimens I have, the large cribriform vibracular plates (much larger than the zooecia) are mostly broken away, the open spaces show as vacuities sufficiently large to be visible to the naked eye, and give a peculiar spotted appearance to the zoarium. This and the shape of the aperture (opesia) show it to be quite distinct from any other species.

Caleschara parva, n. sp. (Pl. II., Fig. 12).

Zooecia ovate, not contracted below; an open space below the thyrostome, from the thickened lower margin of which a narrow calcareous plate projects, and is united to the underside of the proximal margin of the opening. Ooecia quadrate, but globose.

Locality.—Mitchell River (J. Dennant).

This much resembles *C. denticulata*, but is smaller; the zooecia are of a different shape and do not encroach on one another longitudinally, as in that species. The structure of the opening below the thyrostome is not exactly the same. In this species the margin of the opening is continuous, and the plate, projecting over it, is united to under side of the lower part; in *C. denticulata* it is on a level, and is continuous with the front wall, the open spaces being quite distinct, whereas in this species the opening shows as a single one with a bar or plate, which does not interrupt the margin. The ooecium also is very different from that of *C. denticulata*, as figured by Dr. MacGillivray in P.Z.V., pl. 48.

Thalamoporella rosieri (*Audouin.*) *form* longirostrata, nov. (Pl. II., Fig. 14).

Zoarium bilaminate. Zooecia in linear series, oblong with distal end rounded; margins raised; no "tubercles" near the opesia, which is suborbicular; two large foramina below the opesia; the proximal part of the intervening cell-wall depressed below the level of the front of the zooecia. Avicularian cell very long, mandibular cavity long and pointing distally.

Locality.—Jimmy's Point, Gippsland Lakes (J. Dennant).

This differs from the four varieties of *T. rosieri*, described by Mr. Hincks in A.M.N.H., ser. 5, vol. VI., p. 379, where he sums up their distinctive features as follows:—

"1. Normal form, with marginal tuberosities and large bilobate ooecium; avicularia none.

2. Form *gothica*. With marginal tuberosities, destitute of ooecia; avicularia large, with triangular mandible. Mazatlan and California.

3. Form *indica*. Without tuberosities; avicularia large, with somewhat elongated slender pointed mandible. Large bilobate ooecium. India.

4. Form *falcifera*. With marginal tuberosities; avicularia large, with much elongated tapering falciform mandible. Ooecium (?). Australia."

The form I now describe differs from the normal in having avicularia and no tuberosities; it is near form "*Indica*," with which it agrees in having no perceptible "tuberosities," and has

avicularia which, however, are very much longer than the zooecia, those of *Indica* being only about half the length; and it differs from all the forms in being bilaminate, and in the calcareous extension below the opesia, between the foramina being very narrow and depressed proximally below the surface of the ooecia, causing the proximal margin of the open space to be continuous, and the foramina, consequently, not be so distinctly, or distally, separated, as in the other varieties. This feature is much more marked in the following species, in which, however, there are other characteristics which separate it from *T. rosieri* and its varieties.

Thalamoporella gracilis, n. sp. (Pl. II., Fig. 13).

Zoarium cylindrical, about six zooecia in transverse direction. Zooecia elongate, sides straight, arched above, margins raised; opesia su bcircular, below it an opening with a downward prolongation of the upper margin, reaching and united to the under surface of the lower margin; avicularia oval, pointed proximally.

Locality.—Jimmy's Point, Gippsland Lakes (J. Dennant).

I found numerous specimens of this species in the deposit. It differs from the preceding one in the following particulars:—The zoarium is cylindrical or in Vincularia-form, the zooecia are much smaller, there is a very slight tuberosity on each side of the opesia, the calcareous process dividing the two foramina is much narrower, is not always central, and in some instances does not appear to be connected with the proximal margin causing the two foramina to appear as a single opening in a much more marked manner than in the preceding species; the avicularia are shorter, have a stout bar, and point proximally, not distally as they do in all the varieties of *T. rosieri* which have them.

Palmicellaria quadrifrons, n. sp. (Pl. II., Fig. 15).

Zoarium free, erect, quadrate. Zooecia in single series on each of the four faces, tubular, with perforations on the inner margin, distal part projecting; thyrostome suborbicular, with raised thin peristome, on one or both sides of which is an avicularium with a globular base, on the inner edge of which are two small tubular projections; the mandible is triangular, and opens into the inside of the peristome.

Locality.—Cape Otway (Hall and Pritchard).

The great peculiarity of this species is the form of the avicularia, which is globular. I took them at first to be ooecia, but an examination of a specimen with some zooecia with only one avicularium at the side of the peristome showed their true character, and that the mandible opened into the inside of the peristome. In those zooecia which have an avicularium on each side of the peristome, the mandibular area is not visible. The small tubular projections are probably the bases on which spines were articulated.

Palmicellaria uniserialis, n. sp. (Pl. II., Fig. 16).

Zoarium free, phytoid. Zooecia in single series, elongated, almost tubular, with a rib on each side and one on the middle of the dorsal surface; peristome slightly everted; a row of pores on the inner edge; ooecia small, subglobose. A few perforations round the base.

Locality.—Mitchell River (J. Dennant).

This I place provisionally in *Palmicellaria*, though it differs from that genus in being uniserial, but, as zooecial characteristics are more relied upon for generic classification than zoarial, I have probably placed it correctly. It is allied to the preceding species as the zooecia are of similar shape. I have seen no avicularia. The specimen figured is the only one that shows an ooecium; I have one or two consisting of two zooecia, but the majority of the specimens are single zooecia.

Characodoma, nov. gen.

Zoarium in elongated quadrate internodes. Zooecia uniserial on each face of the zoarium. Thyrostome ovate with a sharp denticle on each side pointing downwards over the lower or distal, triangular portion.

Characodoma halli, n. sp. (Pl. II., Fig. 17).

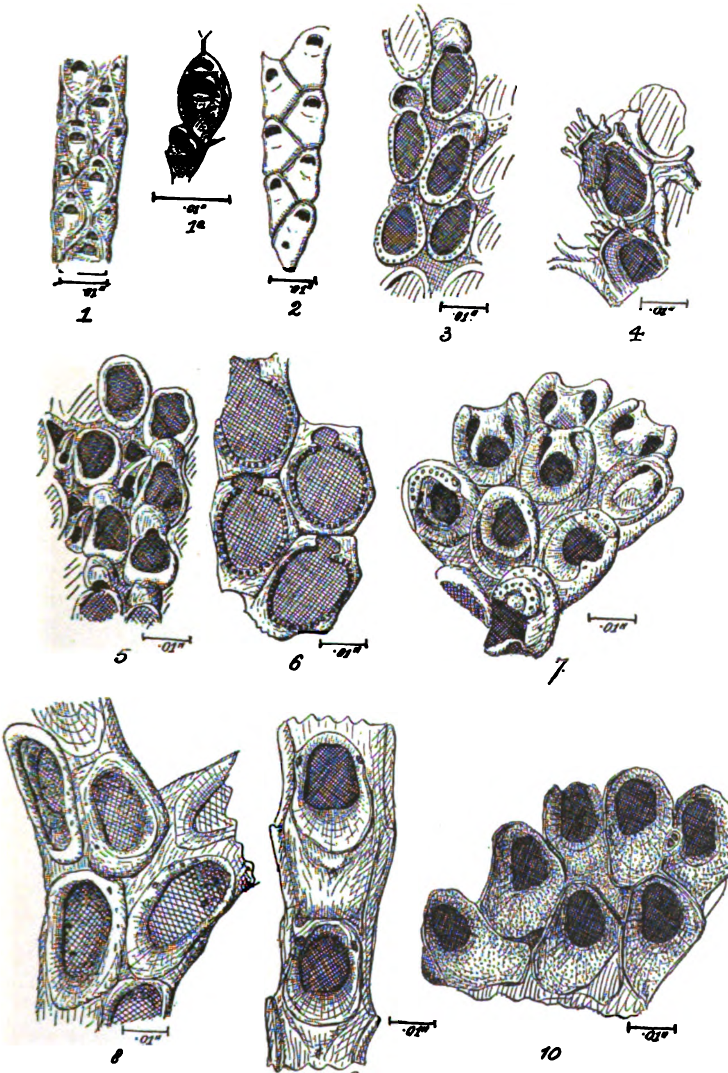
Characters as for genus, but the fertile and infertile zooecia differ considerably. The infertile are suborbicular in shape, convex, covered with mamillae of various sizes; an avicularium, on a more or less prominent elevation, with a triangular mandible on each side (occasionally on one side only) of the thyrostome, which is ovate with a sharp denticle on each side pointing downwards; the lower or proximal portion being subtriangular.

The fertile zooecia are obscurely hexagonal with much elevated very rugose and irregularly nodulated margins, forming a pallisade round the central area which is depressed and smooth; thyrostome the same as in the infertile zooecia; an avicularium on one or both sides of the thyrostome with a triangular mandible; ooecia reniform, densely punctate. Below the lowest zooecium in the internode figured there is a large spatulate avicularium with the mandible placed horizontally, below which the zoarium is attenuated downwards. Similar avicularia occur occasionally on zoaria bearing infertile zooecia in the same position, and also on other parts of the zoarium, causing then a slight irregularity in the disposition of the zooecia.

Localities.—Mornington (T. S. Hall); Mitchell River (J. Dennant).

The portion of the fertile zoarium figured is part of a solitary specimen from Mornington, and is that from which I determined the genus and species; but after having done so I obtained a large number of specimens from the Mitchell River deposit, most of which were composed of infertile zooecia, a few had fertile, and one or two both fertile and infertile zooecia. The specimen from Mornington is the only one which shows the ooecia perfect; in those from the Mitchell River only the base or dorsal wall is preserved, the front wall having been broken or worn off. The perfect internode in all cases is about 0·15 of an inch long, but the fertile and infertile ones differ in the width, the former being 0·027 of an inch in diameter, the latter 0·020.

This is a very interesting and instructive form as it shows the very great and very remarkable difference that may occur between the fertile and infertile zooecia of the same species especially when one specimen bears an ooecium on every zooecium, and another has none; indeed, had I not found some specimens with both fertile and infertile zooecia I would have considered them to be different species, for in the fertile zooecia, as stated above, the front is depressed and smooth with a very much raised rugose border or margin, like a fence or pallisade, while in the infertile zooecia the front is very convex and covered with mamillae. The only features in common being the thyrostome, the avicularia by the side of it, the large spatulate avicularia and the zoarial structure.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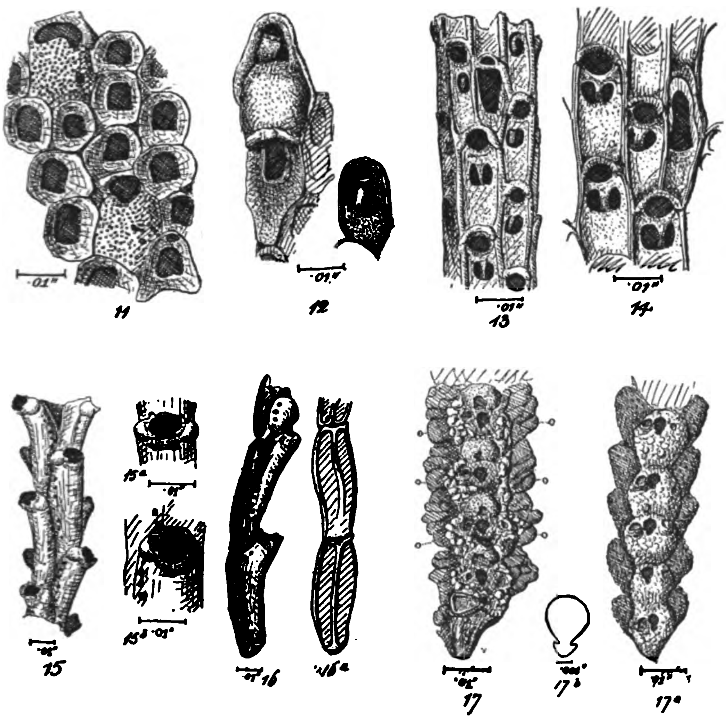
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The apertures of some of the ooecia are not quite perfect, and I have shown the lateral zooecia in outline only but in shadow, so as to facilitate the recognition of the form of one series, indicating the position of the ooecia in the lateral series by the letter "O." The outline of these will show the great irregularity of the rugose margins. In the front view it is almost impossible to show this or their height above the level of the thyrostome; the lateral series in the infertile zoarium is also indicated in outline and in shadow. I have also drawn an outline of the thyrostome (Fig. 17*b*) on a much larger ($3\frac{1}{2}$ times) scale so as to show its structure better.

DESCRIPTION OF PLATES I. AND II.

Fig. 1.—Cellaria biaperta.
,, 2.—Cellaria biseriata.
,, 3.—Membranipora spiculifera.
,, 4.—Membranipora morningtoniensis.
,, 5.—Membranipora dennanti.
,, 6.—Membranipora incurvata.
,, 7.—Amphiblestrum crassissimum.
,, 8.—Amphiblestrum robustum.
,, 9.—Amphiblestrum bispinosum.
,, 10.—Amphiblestrum concavum.
,, 11.—Selenaria cribrosa.
,, 12.—Caleschara parva.
,, 13.—Thalamoporella gracilis.
,, 14.—Thalamoporella rosieri, form longirostrata.
,, 15.—Palmicellaria quadrifrons.
,, 16.—Palmicellaria uniserialis.
,, 17.—Characodoma halli.

Art. II.—*Notes on the Plumage Changes of Petroeca phoenicea (Gould); Pachycephala gutturalis (Latham); and Microeca fascinans (Latham).*

By ROBERT HALL.

(Communicated by the Hon. Sec.).

[Read 19th April, 1900.]

The following notes, made upon three species of our most common insectivorous birds, bear reference especially to the males, because of their development from birds, which, in the early stages, present so marked an opposition in plumage to the adult. Having taken a sample of each of three characteristic genera of our birds and traced their development in plumage, I believe the observations will apply to the many species of the first two treated and a few of the third. While Petroeca exhibits a plain plumage in the early stage and a brilliant one in the later, and Microeca an ornamental plumage in the early stage, with an unassuming one in the later, it is to be noticed that Pachycephala has a striking, though uniform, plumage in the first place, a brilliant one in the last stage, and a quiet grey one in the intermediate stage. In Petroeca and Microeca, the marked changes are performed, roughly speaking, in two acts, while in Pachycephala its varying changes have three distinct and opposed plumages, as regards the colour—the males alone are referred to.

Petroeca phoenicea, Gould.

Until certain of the following specimens were collected by the author, there were two points of interest about which much private discussion occurred:—the first, a local matter, namely where the species goes to in the summer, and the second, whether the male effects seasonal changes in its plumage, and if so, how? By collecting male specimens in the Plenty Ranges on the 27th of January last, and observing others while on an excursion with the Field Naturalists' Club of Victoria, I conclude

without hesitation that it is not a general act for the birds to go further south than this colony to summer, although a few may do so. In addition, from data supplied to me of birds being found in the coastal lines of Mornington in December, and from a nest being found by myself near Box Hill late in the Spring, I am of Mr. Gould's opinion that the species merely becomes secluded during the spring and summer and reventures into the close environment of towns with the income of the autumn.

As to the question of change in plumage, Stage H clearly shows a moult and that the shedding of red feathers is simultaneous with the supplying of new and stronger "reds." As to when the red is first obtained I find in certain cases it appears in the nestling, while in others it may not appear for nearly twelve months, when it bursts out in new feathers as a clear light red.[1] In the following year's moult a strong red is obtained. There is also a red that make its appearance on the chest in the young that seems to me to be light scarlet. There is nothing to indicate that this red does not belong to the nestling, and although it looks as if age had intensified it, there is no evidence in support of it by the other specimens. It is in my opinion a bird highly developed at the first. The "red" when once obtained keeps the bird a "red one" always, and it becomes a flame-breasted bird about the third year. As in the case of Malurus cyaneus, Ellis, the month will vary with the date of brood and the season.

I believe no description of a fully adult male has yet been rendered, for I see no account particularly of the flush of dull red above the forehead, which, in Phase G, is very distinct.

I have handled sixteen male birds that have the appearance of maturity. Of these, nine are uniform grey, agreeing with the description of the adult by Messrs. Gould and Sharpe. Five have so faint a wash of dull red above their foreheads, that it has either been previously overlooked or not taken into account because of its subdued nature; two are distinctly washed with dull red across the fore part of the crown. With this latter crown-colour there is an exceedingly intense red upon most of

1 Dr. Sharpe (Brit. Mus. Catal. Birds, vol. iv., 1879) remarks: "The young male is similar to old female but with orange instead of vermilion breast."

the under surface. Corresponding with the three phrases of the crown are three phases in the red of the under surface—light, medium and strong.

An examination of the following phases has shown me, first, that the white frontal mark may appear in the brown plumage phase or not until the bright red and deep black feathers of a late stage have come; the latter being the exception or in the minority of cases; second, that the orange red of the throat, chest and breast in the majority of cases does not appear until some twelve months have elapsed, but that the nestling or young may have (*a*) stray orange-red feathers on the breast, (*b*) a uniform very pale-red breast, (*c*) a uniform brown breast, which is the general case; in the third place, the black quills and distinct white markings to them, appear as the bird is undergoing its second moult. The throat does not become uniform red till the second moult is effected. The scarlet red of the adult does not appear within at least two years, and the flame-red, three.

Although I have had no opportunity to examine a phase actually from the nest, many of its feathers, if not all, are seen in Phase B, which is, in my opinion, practically a nestling with a longer wing and tail. It is still an open question, and I have thought it better to leave a doubtful gap rather than wait, possibly years, to find and record it under these remarks Phase B is recently out of the nest and retains the back feathers of the nestling, judged by analogy. At the same time it shows its first plumage to have pale orange-red feathers on the chest, which is not so in four of the five stages of Phase C, and but feebly in the fourth stage of Phase C. In addition there is a small white frontal mark that is not in the far advanced Phase E (which is brown), though represented in certain stages of Phase C. The five stages of Phase C are birds in brown plumage and except in one case, C_4, where there are particles of very faint red about the breast, there is no red. The strong white of the forehead clearly shown in C_5, is scarcely visible in C_1, while in the intermediate stages it varies. The distinct white wing bar of the adult is represented in C_1 by a bar of buff, which varies gradually between C_1 and C_5, in the latter being a fairly clear white, but not the strong white of the mature bird. The under tail coverts of C_1 are not so white as in C_5. Phase D shows two of its stages to

have a conspicuous chest patch of red, with frontal patch and abdominal area white, while a third has only a flush of red, and that upon its throat, with frontal mark brown and white. Although two stages of Phase D may be no older than any stage in Phase C, and both having the same time removal from Phase B, I place them under different heads because of the red in D that is not in C. The third case just referred to is placed with D on account of the orange-red throat and brown chest. Phase E is a most interesting one. A week earlier in its career it would have been placed with C, but being now in a state of metamorphosis, conspicuous with contrast of feathers, it stands apart from all others. The breast, back and wings show most of their plumage to be of the early stage, but bright red is appearing through the breast feathers, and jet black quills are maturing in the wings, while the tail has dropped its brown quills before the "blacks" are ready to serve their purpose. The examples of Phase F show the first clear light red of most of the under surface after the moult of "brown," one a deeper red than the other. Phase G is the stage figured by John Gould,[1] and generally looked upon as the adult. It is described as such by Dr. Sharpe.[2] Phase H is the fully matured bird. Its red is intense, and but for the developed forehead it would lead one to believe it to be a case of erythrism. Phase J appears to be the same age as H. Its value lies in the moult being clearly shown, and the process of replenishing both quill and contour feathers.

Phase B.

Young ♂, sk., 19-11-97. Heytesbury, Victoria. (Per Mr. George Graham).

It has recently left the nest and has its wings and breast colours more intensified than in the stages slightly older. The whole of the upper brown surface shows the streaked feather so characteristic of the nestling, the whole length of the rachis of each feather being whitened; frontal mark, white; wings, deep brown with a tawny band across each, and tawny edgings to secondaries and coverts; tail, deep brown, except outer

1 Birds of Australia, vol. iii., pl. 6.

2 Brit. Mus. Cat. Birds, vol. iv

rectrix, which is whitish with a brown edge along most of the inner web, and a brown patch towards the extremity of the outer one; throat, chest, lower breast, and lower abdomen, greyish-brown; upper breast, pale orange-red; under wing coverts, pale salmon-grey; bill, deep brown; legs, brownish-black. Length of wing, 2·8 inches; tail, 2·25 inches.

There is a possibility that an error has been made in the identification of this specimen, as both *P. phoenicea* and *P. leggii* breed in the same district. It is not consistent with the numerous other skins of young handled by me, and in all probability it should not show any red. That phase C shows a single red feather is more likely to be abnormal than normal. For this reason it will be better to consider this phase of *P. phoenicea* has not red upon the under surface.

Phase C.

Stage C_1. Young ♂, sk., 10-1-97. Myrniong, Victoria.

Although older than B it shows no pale orange-red breast. This is the nearest stage to B, because in it there remain the characteristic shaft-marking of the dorsal contour feathers and buff, oblique markings of the wings; coverts greatly tipped with rufous brown; outer tail quills, though mostly white, show brown markings at the bases; upper surface brown, small frontal mark light brown, tending to cream, all but outer tail feathers deep brown; under surface light brown, tending to white, and whiter than in any other stage; the abdomen almost white; beneath breast plumage lie concealed three solitary faint red feathers which are not of very recent development; under wing coverts ruddy brown; bill and legs deep brownish-black. Length of wing, 2·85 inches; tail, 2·4 inches.

Stage C_2. Young ♂, sk., Oct. 1899. Essendon, Victoria.

Upper surface brown; forehead like back; under surface lighter brown, except on abdomen, which is creamy white; under tail coverts cream white, and whiter than in C_1; oblique bands across wings whiter than in C_1; outer tail quills whiter than in C_1; bill and feet blackish; length of wing, 2·85 ins.; tail, 2·2ins.

Stage C_3. Young ♂, sk., 1-6-97. Box Hill, Victoria.

Similar to C_2, except the frontal mark, which is more distinct from the forehead; primaries lighter brown than in 1 and 2.

Stage C_4. Young ♂, sk., Victoria.

The head being rich brown makes it differ from the other stages. Upper surface brown; small frontal mark brown, with a faint inclination to white in it; whole under surface inclined to rich brown, and in parts of the throat, chest and breast to light reddish-brown; one centre quill of the tail shows white at tip, not previously noted. In other respects it agrees with the other stages of this phase. Length of wing, 3 ins.; tail, 2·4 ins.

Stage C_5. Young ♂, sk., 10-7-97. Essendon, Victoria.

Frontal mark white and of adult's superficial area; rest of forehead and crown greyish-brown; edge of penultimate inner secondary white and prominent. These three regions are distinctly in advance of the earlier stages. Under surface much lighter than in any other stage of this phase, the throat tending to greyish white, with much of the latter on the lower breast and abdomen; under tail coverts and outer tail feathers whiter than in the foregoing stages; dorsal surface brown; remaining regions as in C_4. Length of wing, 3·05 inches; tail, 2·4 inches.

Phase D.

Stage D_1. Young ♂, sk, 31-3-97. Heytesbury, Victoria. (Per Mr. Geo. Graham).

Upper surface uniform brown, the upper tail coverts being deeper brown and agreeing with the centre tail feathers; frontal mark brown, intermixed with brownish-white; throat faint red; chest and sides of upper breast brown; centre of breast, abdomen and under tail coverts creamy white, certain of the coverts streaked brown about the mid-rib; flanks brownish; wings deep brown, the coverts and secondaries edged with light brown; band upon wing white, roughly edged with fulvous; bill and legs deep brownish-black. Length of wing, 3·05 ins.; tail, 2·35ins.

Stage D_2. Young ♂, sk., 12-4-98. Essendon, Victoria.

Upper surface light brown; central tail feathers brown, very small spot of brown on outer web of outer feather; penultimate tail feathers brown, with an oblique portion of it dull white; frontal mark small and white; wing brown, cream band across it and secondaries edged with cream; coverts greyish-brown; chin greyish-white; throat brown, with a cream coloured band across

lower part; chest light scarlet; breast and abdomen white; flanks brownish; under tail covers deep cream; bill and legs black. Length of wing, 2·7 inches; tail, 2·15 inches.

Stage D_3. Young ♂, sk., 12-10-99. Victoria.

This skin is practically the same as D_2, the conspicuous patch of the same hue of red across the chest occupying less of the chest and more of the breast than in D_2. Length of wing, 2·75 inches; tail, 2·15 inches.

Phase E.

Imm. ♂, sk., 27-1-00. Plenty Ranges, Victoria.

This specimen shows abundant evidence of a thorough ejectment of one quarter of its brown plumage. That it is a young bird, and is assuming the strongly contrasted "blacks and reds" of the adult is quite evident. Before collecting, I observed it to fly some thirty yards over the bracken just as a Sericornis, or Malurus would do. The process of moult was taxing its grace in flight. The portion of the old plumage remaining is the brown of the breast, back, and half of the wing quills. The reds are coming and many have appeared in a blotchy manner upon its breast. The old tail quills have all been displaced by new, soft and short ones, the laterals being white-edged; forehead brown, not yet moulted; lores black; 1, 2, 3 and 4 primaries are old and grey; 5 is a new black quill two-thirds correct length; 6, 7, 8 and 9 quills are new and black, spotted with white as in adult; 10 is new and black and half grown; the remaining quills are old and grey, new innermost secondaries black; wing coverts are new in addition to old, while others are maturing; upper tail coverts are new and old, intergrowing; under wing coverts "bursting;" under tail coverts principally new; head feathers are partly new blacks, but mostly old greys; legs feebly feathered, mostly new. The "reds" of the lower portions of the chin and throat are in their sheaves, though visible owing to the partial fall of the old feathers; under surface brownish-grey, feathers old; bill and legs black. Length of wing, 2·9 inches; tail, 1·35 inches.

Phase F.

Stage F_1. Imm. ♂, sk, April, 1897. Heytesbury, Victoria. (Per Mr. Geo. Graham).

Without a standard for comparison or a knowledge as to what range the under and upper surfaces have in their colouration one would believe this to be a fully developed bird. Place it against a fully adult skin and you will find the red of the under surface lacks density, the grey of the upper is not so leaden, and the forehead is uniform with the grey crown. The frontal mark is white; lores dark slate; chin grey; abdomen and under tail coverts white; central tail feathers slate-brown, lateral mostly white, penultimate tipped white; wings brownish black, secondaries and coverts edged white; inner primaries tipped white; the white patches on quills clear white; under wing coverts smoky white, and whiter towards tips; base of lower mandible light brown, other portions of bill deep brown; legs leaden-black. Length of wing, 3·15 inches; tail, 2·45 inches.

Stage F_2. Imm. ♂, sk., 30-8-97. Essendon, Victoria.

It is very much the same as F_1. There is a flush of dull red, scarcely perceptible above the frontal mark, that indicates the approach to maturity.

Phase G.

Imm. ♂, sk., 10-7-97. Maribyrnong, Victoria.

A description is not necessary for this phase, as it has been described as the adult.[1] By the above I do not wish to convey the meaning that Dr. Sharpe has described an immature bird for an adult, but, rather, that an immature adult has been described when a stage distinctly more developed would have been described had the skin been available or a previous description known to be on record.

Phase H.

Ad. ♂, sk., 1898. Victoria.

When this skin is placed parallel with fifteen others together, a glance at each of the crowns will show this to be coloured dull red, while all the others are greyish; a careful look will show some of them to have a faint flush of dull red upon their crowns. Still keeping them in a row, the ventral red of this specimen shows distinct from all others in its intensity.

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1 Brit. Mus. Cat. Birds, vol. iv., 1879.

The frontal mask is silky white; across base of forehead a narrow black line; flush of dull red above frontal mark and on to crown, which is dull slaty-grey, like the rest of the dorsal region; lores slaty-black, sides of face and ear coverts grey; tail slaty-black, except outer quills, which are mostly white, an oblique brown mark being upon inner web and a second brown mark towards tip of outer web; penultimate quills partly white; chin and sides of throat slaty-black; throat, chest and breast rich scarlet; lower part of abdomen and under tail coverts white; flanks slate-grey, with white tips to feathers; primaries black at base, sooty-brown at distal half, a band of white across the inner series near base; secondaries brownish-black, external webs edged white; inner primaries and secondaries tipped white; lesser wing coverts blackish-grey, other coverts white, or black tipped white; under wing coverts and axillaries brownish-grey, with whitish tips; thighs brownish-grey; irides, bill, legs and feet, black. Total length 5·1 inches; culmen, 0·45 inches; wing, 3·05 inches; tail, 2·4 inches; tarsus, 0·8 inches.

Phase J.

Adult ♂, sk., 27-1-00. Plenty Ranges, Victoria.

The value of this skin is shown in the method of its change in the colour of its plumage, while strong "reds and blacks" have appeared and are still appearing, the old weak reds and wing quills have not all yet been pushed away. It is exhibiting a thorough renewal of the complete plumage. On the breast are some very bright new "reds," judged to be new by the quill barrels and faded old reds. The primaries are very unequal. Counting inwards, the fifth is just leaving its sheath, and the sixth averages half-an-inch shorter than those adjacent. The tail quills are considerably off their normal length in the centre, and much shorter laterally; the white of the external quills being clear white, as in full age; under tail coverts pure white and new; thighs newly feathered, though not yet concluded. The head has new dull red feathers in addition to new "greys," and the back has new as well as old "greys;" bill and feet black. In other respects it appears to agree with the last phase.

Pachycephala gutturalis, Latham.

A glance at the specimens exhibited in support of this species shows three distinct colour phases; the young being uniform rusty-brown, the intermediate stage varying grey and brown, the adult phase jonquil-yellow, black and white. Six phases clearly show the development towards a seventh or mature stage. A, B, C, E and F demonstrate steps in the growth of the male, while D shows a stage of the female immediately after C, when the male "yellows" fail to appear, and the stage progresses no further. In outward material this is where the female is first and always recognised. It is at this stage that the last of the rusty brown feathers of early age drop out and, if a female, they are simply replaced by "greys," but if a male, a few "yellows" appear. This is where the index of sex is first shown externally, though feebly.

While both sexes are in the nest, they are rufous. Upon leaving the nest, a few light brown feathers mix, and these remain for some time. In early spring of the following year the rusty coloured secondaries are all that remain of the brown phase. Following this stage, if the bird is to prove itself a male, a slight indication of "yellow" will appear somewhere in the regions of yellow. Being now spring, the bird, in my opinion, will, in rare cases, breed in this far from nuptial plumage, but, as a rule, it will hold over this part of its career until the following season. As in many other Australian birds, I take phase E_1 to be a precocious male breeding, but not in breeding plumage, showing only the faintest external indication of its sex, but strongly developed internal organs. This bird was perched close to a nest of eggs, and was delivering a pleasant strain, much as an adult would do. Phase F is the connecting link of the adult and junior stages. A few black feathers of the head and pectoral collar are first to appear, while one or two "yellows" below the breast help to indicate the sex. There is yet no indication below the plumage of the mass of yellows. Probably they will come with the throat "whites," of which there is no sign just now. Being August 25, I am strongly disposed to believe no development into full livery will come into effect until early next spring. The state of plumage of this specimen is specially interesting.

Phase G is the bird known as the adult male. In addition to this last place, Dr. Gadow[1] describes a young male differing in a few minor points only from one of the phases here noticed.

Phase A.

Nestling ♂, sk., 7-11-96. Heytesbury, Victoria. (Per Mr. George Graham.)

Rufous strongly predominates throughout the plumage, being most marked upon the throat and chest; wings brownish, edges pale, the secondaries and their coverts bearing a rufous flush; shoulders dusky white; bill brown; feet yellowish brown. Length of wing, 2 inches; tail, 0·25 inches; culmen 0·25 inches.

Phase B.

Young ♂, sk., 12-1-97. Myrniong, Victoria. (Per Mr. T. A. Brittlebank).

Whole of plumage rufous except tail, primaries and portions of secondaries, which are greyish-brown; edges of primaries light; rufous of abdomen much lighter than on other portions; humeral coverts whitish; bill and legs light brown. Length of wing, 3·5 inches; tail, 2·35 inches; culmen, 0·42 inches.

Phase C.

Young ♂, sk., 17-12-96. Caldermeade, Victoria.

Under surface brownish-cream, with rusty brown feathers irregularly distributed on each side of the throat, the left side of the chest, the centre of the breast, and feebly upon the abdomen; under tail coverts washed with light brown; wing primaries light brown; secondaries and coverts richly marked with rusty brown; forehead grey; crown and ear coverts light rusty brown; remainder of upper surface greyish-brown, with individual pale rufous feathers intermixed; upper tail coverts faint rufous; tail greyish-brown; under wing coverts and axillaries whitish; bill deep brown at distal end, light brown proximal end; legs slaty-black. Length of wing, 3·7 inches; tail, 3·25 inches.

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1 Brit. Mus. Catal. Birds, vol. viii., 1883.

Phase D.

Young ♀, sk., 28-8-96. Box Hill, Victoria.

Upper surface brownish-grey (adult grey next moult); a touch of deep brown on the upper tail coverts; primaries light slate, light edgings; secondaries rufous, except centres of innermost, the edges of the outermost being slate-brown and only edged with rufous; under surface as in adult, with a flush of light brown added, to slightly obscure a tendency to white on the throat and to darken the breast; under tail coverts white, the shaft of each feather brown; bill deep brown, lighter at base of mandible; feet slate. Length of wing, 3·7 inches; tail, 3·1 inches.

Phase E.

Stage E_1. Young ♂, sk., 19-9-96. Box Hill, Victoria.

Head and neck, dark grey; back, dark grey washed with pale olive, slightly more pronounced on the upper tail coverts; tail uniform (greyish), a slight flush of olive on the middle quill; primaries slaty-black, light grey edgings, secondaries edged with olive-green; coverts olive-grey; under wing coverts, whitish; lores grey, like head; throat whitish; chest and breast grey, tinged with indistinct yellow; abdomen and under tail coverts whitish, flushed with tawny yellow; bill and feet black. Length of wing, 3·85 inches; tail, 3·1 inches.

Stage E_2. Young ♂, sk., 10-1-97. Myrniong, Victoria.

Secondary coverts bright yellow; throat approaches nearer white than E_1. Beyond these regions much as in E_1.

Stage F. Imm. ♂, sk., 25-8-96. Heytesbury, Victoria (per Mr. Geo. Graham).

Upper surface greyish, the back and upper tail coverts washed with olive; forehead slightly intermixed with black feathers (new); wings blackish slate coloured edgings; certain of the secondaries edged with pale olive-grey; tail grey, one or two of the quills slightly darker at the distal end; throat greyish-white; brownish-grey crescent, narrow on the chest and broad on the sides, above which in the middle of the chest is appearing a blackish pectoral band; breast and abdomen fawn-white, deeper on the flanks; a few small patches of yellow appear on breast, abdomen and sides of chest; under wing coverts white; under

tail coverts white; bill black; legs deep brown. Length of wing, 3·9 inches; tail, 2.9 inches.

Phases G and H.

Adults, ♂ and ♀, are described in the British Museum Catalogue of Birds, vol. VIII., 1883, by Dr. Hans Gadow.

Microeca fascinans, Latham.

This species shows at least five phases in the development of its plumage, two of which are strongly contrasted immediately before and after the first moult. The nestling A, very different from the parents, bears a small distinguishing tail, in this respect resembling the adult. Specimen B, a few weeks out of the nest, presents much the same appearance as the nestling, days before it leaves the nest. The first moult does away with the whole mottled plumage, excepting the winglets, and the dress becomes dull and uniform. It still remains darker than in the following phases. C is an immature bird, yet, though younger than D, it presents higher developed tail quills and winglets, by carrying more white upon them. As a set-off against this prematurity are the brown base to forehead, and brownish edges to wing quills, which, along with other parts, indicate a younger stage than D. The specimens D and E are what appear to be matured birds. While D is greyer than C, E is greyer than D; the deep brown of A giving way regularly through all the stages to a brownish-grey in E. Specimen E has its centre tail quills tipped with white, being the most highly developed stage of all.

Phase A.

Nestling, sk., 2-11-94. Box Hill, Victoria.

The whole plumage, except wings, abdomen and under tail coverts, is mottled, owing to the exposed end of each feather having a white cuneate mark upon a deep brown feather. The white predominates upon the neck, and the dark brown upon the head. The breast presents a blotchy appearance, because of faintness of white marks. Wings brown; primaries tipped with a brownish-white; secondaries edged with a pale tawny; coverts bearing the wedge-shaped marks of the back; under wing and tail coverts chalky white; a small amount of lustre on the

white of the abdomen; lateral tail quills white, each feebly marked on the tips with brown; centre quills brown; bill and legs brown; nails brown. Length of wing, 1·8 inches; tail, 0·95 inches; tarsus, 0·57 inches; culmen, 0·23 inches.

Phase B.

Young ♂, sk., 1-1-97. Box Hill, Victoria.

General appearance of plumage very much as in A. The first indication of a moult of the original feathers shows on the back where a patch of uniform dark brown feathers has appeared with others following. In a few days, I take it, the moult of the contour quills will be general. Tail: outer quill white, except at tip which is faintly spotted with brown; penultimate quill white, with the inner web of the proximal half obliquely marked with brown; the third quill similar to the second, but with more and deeper brown in about the same position; centre quills dark brown; bill blackish-brown; legs brown; nails black. Length of wing, 3·3 inches; tail, 2·45 inches; tarsus, 0·6 inches; culmen, 0·3 inches.

Phase C.

Imm. ♂, sk., 26-8-93. Box Hill, Victoria.

It presents quite a different appearance from the spotted example B. The tails remain nearly alike. Upper surface and forehead, brown; sides of breast, greyish-brown, other portions of under surface white, tinged with light brown in parts, and delicately washed with it in other portions; primaries narrowly tipped, and secondaries edged, with pale brown; under wing coverts whiter than in B; outer two rectrices white, third deep brown on basal two thirds of inner web, fourth bears a large white mark on terminal part of inner web; middle quills, deep brown; bill, upper mandible black, lower brown; legs, blackish-brown. Length of wing, 3·4 inches; tail, 2·45 inches; culmen, 0·35 inches; tarsus, 0·7 inches.

Phase D.

Adult ♂, sk., 17-7-96. Box Hill, Victoria.

The whole upper surface is lighter brown than in C, and the ventral brownish-white of C is here represented with a clear

white; narrow base of forehead white; primaries narrowly tipped and secondaries mostly edged with white; the four outer tail quills much as in C, except that there is more brown on the basal half of the inner web of the second, and much more on the third. This appears as if the colour gradation of the tail is no safe index to the age of the bird. Certainly the tail appears not to be so far advanced towards maturity as in C, also the wing speculum is brown, while that of C is white, showing more maturity. Evidently the parts of a bird's plumage do not develop uniformly to indicate the age of the bird. Other parts of the plumage are more advanced than in C. The sexes are said to present no difference when adult. Bill and legs black. Length of wing, 3·5 inches; tail, 2·55 inches.

Phase E.

Adult ♂, sk., 10-4-97. Heytesbury, Victoria. (Per Mr. Geo. Graham).

Similar to D, the whole upper surface having more grey upon it. All the white edges of the wings are much deeper and clearer, including the wing speculae. The tail has more white upon the lateral quills, and the centre ones are tipped with white. Under mandible and feet are blacker than in D. Length of wing, 3·5 inches; tail 2·55 inches.

Art. III.—*Phreatoicus shephardi—a New Species of Fresh-water Isopoda from Victoria.*

By O. A. SAYCE.

(Plate III.)

[Read 19th April, 1900].

The species here described I received from Mr. J. Shephard, together with an undescribed Amphipod, and both were collected by him during a late Field Naturalists' Club excursion to the Plenty Ranges, which forms part of the Dividing Range, and is situated about 35 miles from Melbourne. A report on the district, with lists of fauna and flora, appears in the "Victorian Naturalist," vol. XVI., pages 163-170, in which, concerning the present species, Mr. Shephard says, "Several specimens of small Crustacea were secured from among the spongy mass of lower plant-life growing on the hillside, at the source of a spring, which is evidently permanent, as it is utilized for supplying the houses with water." I may further add that the spring is on the north side of the Dividing Range, and runs into the Wallaby Creek, that the geological formation is a small granite area, surrounded by a wide expanse of Upper Silurian, and that the altitude is about 2000 feet.

Unfortunately only one of the present species was obtained. It proved, on dissection, to be a male, and it is of interest as belonging to the peculiarly Australasian family Phreatoicidae, which is so far removed from other Isopods as to warrant, according to Stebbing, a new tribe, concerning which he says, "The genus is beyond dispute remarkable, requiring to be placed in a separate family, and though some may prefer to class this among the Asellota, I have ventured to think that a separate tribe Phreatoicidea should be instituted to receive it."[1] Chilton, who instituted the genus, has admirably discussed its characters

[1] A History of Crustacea, by Rev. T. R. R. Stebbing, M.A. International Sc. Series, vol. lxxiv., p. 391.

and affinities,[1] and, after enumerating the special resemblances to the Amphipoda, says that "an examination of them shows that none is of any particular importance in its bearing on the systematic position of the genus,"[2] and further he says "*Phreatoicus* occupies a fairly central position among the Isopoda, retaining to a greater extent than any others the typical characters of the Isopoda."[3]

Of the genus *Phreatoicus*, three species have been described, two blind forms from subterranean waters in New Zealand, and one, *P. australis*, Chilton, with functioning eyes, from the summit of Mount Kosciusko, New South Wales, which has also been identified by Mr. G. M. Thomson, from Mount Wellington, Tasmania.[4] Two other allied genera have been determined, viz., *Phreatoicopsis*, Spencer and Hall, and *Phreatoicoides*, mihi.

Phreatoicus shephardi, sp. n.

(Pl. III., Figs. 1-10).

Specific Description.—Male (Fig. 1). Body somewhat stout, with few short setae scattered over surface. Eyes not formed. First five segments of pleon with pleura produced inferiorly, rounded below, their inferior margins thickly fringed with long setae, fewer and shorter ones extending along posterior margins. Inferior margins of terminal segment bearing six large curved simple spines, increasing in size distally, and eight finer simple spinules near to the base of the uropods. Margins above uropods rounded, and bearing one large and five small spines. Projection at the extremity of the telson very slightly produced, and tipped by one large median spine, and two smaller lateral ones; also a few long setae.

Upper antennae not reaching to the extremity of the peduncle of the lower, peduncle of three joints, flagellum of seven joints. Lower antennae (length unknown), peduncle as long as the longest axis through cephalon; first two joints subequal, transverse, third as long as first two combined, fourth slightly longer

1 Trans. Linnean Soc. London, Zoology, vol. vi., part i.
2 *Loc. cit.*, page 205.
3 *Loc. cit.*, page 209.
4 Proc. Roy. Soc. Tasmania, 1892, p. 82.

and more slender, fifth still longer, being as long as first three combined. First maxilla with outer lobe narrow, and apically furnished with twelve spines; inner lobe bearing four plumose setae. Maxilliped with distal outer angle of meros much produced, carpus also produced, but in a lesser degree, propodos ovoidal, broader than long, dactylos shorter and much narrower; epipodite extending to distal inner angle of meros. Appendages of peraeon spinose, dactylos of each unguiculate. Gnathopod having the propodos large, palm oblique, straight, clearly defined, and deeply serrated near articulation of dactylos. Pleopods normal. Uropods with peduncle not reaching to the extremity of telson, superior outer margin very spinose, its inferior distal angle not having any very thick setae with pectinations at their ends, inner ramus subequal in length to peduncle, outer ramus shorter; a single stout spine medianly on superior margin of each.

Female.—Unknown.

Colour.—Light brown, with indefinite markings of darker brown.

Size.—10 mm.

Habitat.—From amongst spongy moss at the source of a spring running into Wallaby Creek, Plenty Ranges, Victoria. Altitude about 2,000 feet.

Remarks.—This species is named in honour of Mr. J. Shephard, president of the Victorian Field Naturalists' Club. It agrees rather closely with *P. australis*, Chilton. Compared with Chilton's description of that species[1], the chief distinguishing features appear to be—

(1). The pleon is relative longer. Taking the cephalon and peraeon as 100, then in *P. australis* the proportion is $\frac{58}{100}$, while in *P. shephardi* it is $\frac{66}{100}$.

(2). The dactyli of the legs do not possess a secondary unguis. The palm of the subchelate hand of the first pair is straight, not convex, and clearly defined, not rounded at the postero-distal angle, as in *P. australis;* and, further, it is strongly serrated near the articulation of the dactylos.

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1 Records of Australian Museum, vol. i., pp. 149-171.

(3). There is no appearance of any eyes or pigment.

(4). The uropods have not at the end of the peduncle, below the articulation of the rami, any "very thick setae with a few pectinations at the ends of the upper sides only," which are characteristic of *P. australis*, nor are there any pectinated spinules on the inferior margin of the sixth segment.

(5). The peduncle of the lower antenna is relatively longer.

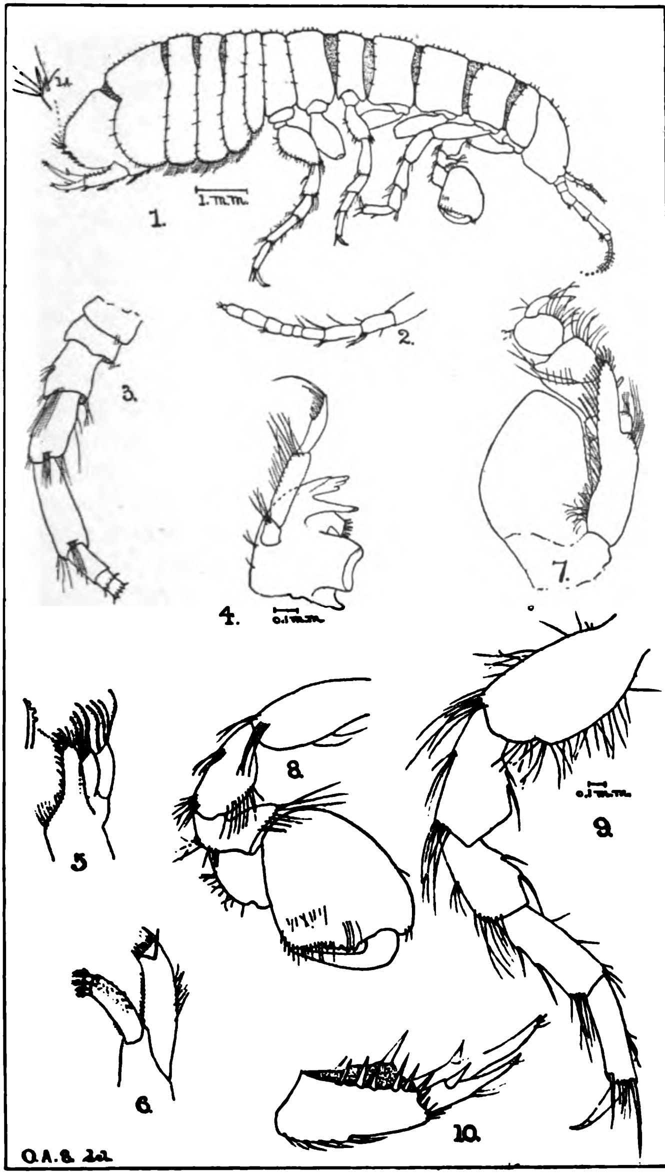
(6). The first maxilla has the outer lobe narrower and bearing only about twelve spines.

(7). The maxilliped has the plate representing the epipodite larger, extending to the distal inner margin of the meros. The distal outer angle of the carpus is somewhat produced, the propodos is wider, being broader than long, and the dactylos is narrower.

DESCRIPTION OF PLATE III.

Fig. 1.—Side view of *Phreatoicus shephardi*.
„ 1*a*.—Projecting piece of Telson, under higher magnification.
„ 2.—Upper Antenna.
„ 3.—Lower Antenna.
„ 4.—Left Mandible.
„ 5.—Second Maxilla.
„ 6.—First Maxilla.
„ 7.—Maxilliped, inner surface uppermost.
„ 8.—Part of First Peraeopod.
„ 9.—Seventh Peraeopod.
„ 10.—Uropod of Left side.

N.B.—Fig. 1 is drawn to a scale shown beside it, which represents 1 mm. equally enlarged. Figs. 2, 3, 8, 9 and 10 are drawn to a scale shown beside Fig. 9, representing 0·1 mm., and Figs. 4, 5, 6 and 7 are drawn to a scale shown beside Fig. 4, also representing 0·1 mm. enlarged.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Art. IV.—*Further Descriptions of Australian Earthworms, Part I.*

By BALDWIN SPENCER, M.A., C.M.Z.S.,

Professor of Biology in the University of Melbourne.

(With Plates IV.-XII.)

[Read 19th April, 1900].

Since the previous publication by Mr. Fletcher and myself of descriptions of Australian earthworms, Mr. Beddard has published his extensive and valuable monograph dealing with the Oligochaeta, and, for the sake of convenience, I have adopted in this paper the generic names used by him.

The present communication deals with specimens collected in Queensland and Victoria, and includes a description of 37 new species. Of these, seven belong to the genus Megascolides, three to Cryptodrilus, thirteen to Diporochaeta, nine to Megascolex, and three to Digaster, while, in the case of two species, it has been found necessary to form new genera, for which the names Trichaeta and Diplotrema are proposed.

For valuable assistance in collecting, I am indebted to Messrs. C. French, C. Frost, Dudley Le Souëf, T. Steel, J. Shephard, C. M. Maplestone, H. T. Tisdall, G. B. Pritchard, J. H. Fardy, R. A. O'Brien, and W. Mann.

The earthworm fauna of Australia is peculiarly rich, but at present our knowledge of it is almost entirely confined to specimens collected in the eastern coastal districts, and the present classification can only be regarded as a temporary one.

In this descriptive notice only macroscopic characters are dealt with. Miss G. Sweet and Miss A. M. Lambert have been recently engaged in research, in the Biological Laboratory of the Melbourne University, into the structure respectively of the spermiducal glands and associated structures and the nephridia. A paper upon the former by Miss Sweet, containing much

valuable information, will shortly appear, and the results of Miss Lambert's work on the nephridia will be published before long; this work will, it is hoped, enable us to gain a better idea of the relationship of the different forms. So long as only a limited number of species were known the work of classifying appeared to be comparatively simple, but as our collections increase it becomes evident that the present arrangement is only a tentative one. In illustration of this it may be pointed out that even the family Perichaetidae is extremely difficult to adequately define and that further work may render it necessary to combine in one family the genera which are at present referred to Perichaetidae and Cryptodrilidae.

In regard to the distribution in Australia of the genera, as defined by Beddard, it may be noted that Megascolides and Diporochaeta are distinctly characteristic of Victoria. Cryptodrilus is well represented in New South Wales and Victoria, but poorly in Queensland, and the same applies to Megascolex, while Acanthodrilus and Perichaeta are unrepresented in south-eastern Australia.

Trichaeta, gen. nov.

Perichaetidae with not more than six setae on each side of the segment, arranged in pairs Nephridia plectonephric. Spermiducal glands lobate.

Trichaeta australis, sp. n. (Figs. 1, 2, 3). Spirit specimens 3½ inches long, ¼ inch broad. Number of segments 140.

Prostomium completely dovetailed into the peristomium, which is ribbed all round.

Clitellum not distinguishable (though the specimens are apparently mature).

A swollen glandular patch in the mid ventral line, half on segment 15 and half on segment 16.

Setae difficult to see in spirit specimens. Arranged typically in three pairs on each side; the ventral pair very regular along the whole length; the two other pairs irregularly arranged, and occasionally, but not often, one of these pairs may be wanting. The setae of each pair always placed close together.

Male pores on well marked papillae on segment 18 at the level of the ventral pair of setae.

Oviduct pores on segment 14.

Spermathecal pores two in number; intersegmental; between segments 7 and 8, and 8 and 9.

Alimentary canal. Gizzard in segment 5. No vascular swellings or calciferous glands. Large intestine commencing in segment 18.

Blood vascular system. Single dorsal vessel. Two large hearts in segments 13 and 14, two smaller ones in segments 11 and 12.

Excretory system, plectonephric. Peptonephridia well developed.

Reproductive system. Testes, one pair in segment 11, in which also the ciliated rosettes are placed.

Spermiducal glands lobate, with long, well-marked ducts in segment 18.

Sperm sacs attached to the anterior wall of segment 12. Ovaries attached to the anterior wall of segment 13, into which the oviducts open.

Spermathecae two pairs, in segments 8 and 9; each consists of a somewhat spherical sac, with a very short diverticulum close to the body wall.

Habitat. Narre Warren (S. Gippsland, Victoria), under logs in damp soil.

Diplotrema, gen. nov.

Cryptodrilidae with the openings of the vasa deferentia on segment 18 distinct from and in front of those of the spermiducal glands. Nephridia meganephric and paired. Spermiducal glands tubular.

Diplotrema fragilis, sp. n. (Figs. 4, 5, 6). Spirit specimens 1 inch long, one-sixteenth inch broad. Number of segments, about 125.

Prostomium wedged slightly (about one-third) into the peristomium.

Clitellum distinct extending over segments 12-17; a large oval glandular patch in the mid ventral part of segments 16-19. Segment 8 is noticeably glandular and swollen.

Setae arranged regularly in two pairs on each side; the setae of each pair close together; the dorsal pair about one-third of the height of the body from the ventral line.

Male pores on papillae on segment 18 at the level of the interval between the two setae of the ventral pair on each side.

Spermiducal pores on segment 18 just behind but distinct from the male pores.

Oviduct pores on segment 14.

Spermathecal pores two; intersegmental on small oval glandular patches at the level of the interval between the ventral pair of setae between segments 7 and 8, 8 and 9.

Dorsal pores present; the first between segments 8 and 9.

Alimentary canal. Gizzard in segment 5. No vascular swellings or calciferous glands. Large intestine, commencing in segment 16.

Blood vascular system. Dorsal vessel single with heart in segments 7-12.

Excretory system. Meganephric.

Reproductive system. Testes, two pairs in segments 10 and 11. Ciliated rosettes in the same segments.

Spermiducal glands long and coiled; the tube extending over segments 16-21. In the median ventral part of segments 16-20 is a large mass of glands corresponding in position to the glandular area visible externally.

Sperm sacs attached to the anterior wall of segment 12. Ovaries in segment 13; oviducts open into the same segment.

Spermathecae in segments 8 and 9. Each consists of a slightly elongate sac with a spherical diverticulum.

Habitat. Gayndah, Queensland. Found under logs in the scrub.

Megascolides, McCoy.

(1.) **Megascolides diaphanus**, sp. n. (Figs. 7, 8, 9.) Spirit specimens 1¼ inch long, ⅛ inch broad.

Prostomium very slightly wedged into the peristomium.

Clitellum not distinguishable. An elongate glandular patch on the ventral surface of segment 18, and a white, rounded, glandular area ventrally on segments 20 and 21.

Setae regularly arranged; the two of each ventral pair close together; the two of the outer pair widely separate; the distance between them being equal to that between the lower of the two and the ventral pair.

Male pores on segment 18 at the level of the interval between the setae of the ventral pair.

Oviduct pores on segment 14.

Spermathecal pores two; intersegmental; at the level of the ventralmost setae between segments 6 and 7, 7 and 8.

Dorsal pores present. The first visible one between segments 12 and 13.

Nephridiopores indistinguishable externally.

Alimentary canal. Gizzard in segment 5. The walls of the canal in segment 16 are white and swollen, but there is no sharply pinched off portion as in the case of the calciferous glands of other species. Large intestine commences in segment 18.

Blood vascular system. Dorsal vessel single. Hearts in segments 8-12. A strongly marked plexus of blood vessels surrounding the alimentary canal in segments 3-7, the dorsal blood vessel breaking up in the latter.

Excretory system.[1] Two nephridia on each side of the segment.

Reproductive system. Testes, two pairs in segments 10 and 11, into which also the ciliated rosettes open.

Spermiducal glands, small, coiled, tubular, in segment 18.

Sperm sacs, racemose, attached to the posterior wall of segment 9, and the anterior of segment 12.

Ovaries in segment 13, the oviducts opening into the same segment.

Spermathecae in segments 8 and 9. Each consists of a long sac with two short tubular diverticula.

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1 In consequence of the presence of three nephridia in each segment in certain forms described by Mr. Fletcher and myself, Mr. Beddard has placed these in a new genus, to which he has given the name of Trinephrus. It may subsequently be advisable to erect a new genus for the reception of the present and one or two other species characterized by the presence of two nephridia on each side and to which the name Dinephrus may be given. Meanwhile pending an examination into their microscopic structure, which is now being conducted and the results of which will shortly be published, I have retained the species in the genus Megascolides.

Habitat. Near to the Ebeneezer Mission Station, Mallee District, Victoria. Found in very moist earth on flats close to the River Wimmera. The body is very transparent, the nephridia and blood-vessels being visible through the skin. The flats on which the worm was found are liable to be flooded at rainy seasons but are at other times perfectly dry.

(2). **Megascolides steeli**, (Figs. 10, 11, 12). Spirit specimens 5 inches long, $\frac{3}{8}$ inch broad. Number of segments 385.

Prostomium completely dovetailed into the peristomium, marked by a median groove.

Clitellum well developed, extending over segments 13-18: incomplete ventrally on segments 17 and 18. Accessory copulatory structures; an oval patch on each side of the median ventral line at the level of the lower pair of setae between segments 17 and 18 and another slightly larger one between segments 18 and 19.

Setae regularly arranged. The two of each outer pair further apart than those of the ventral pair and about half-way up the side of the segment.

Male pores on segment 18, on a papilla at the level of the interval between the setae of the ventral pair.

Oviduct pores on segment 14.

Spermathecal pores two, intersegmental, at the level of the ventralmost setae on each side, between segments 7 and 8, 8 and 9.

Dorsal pores present, the first between segments 14 and 15.

Alimentary canal. Gizzard in segment 5. Vascular swellings in segments 12-15. Large intestine commencing in segment 18.

Blood vascular system. Dorsal vessel, together with a supra-intestinal vessel, as far back as segment 12, in which it gives off in the hinder part of the segment one branch to the dorsal vessel and one to the heart. Hearts in segments 8-12.

Excretory system, meganephric. Peptonephridia well developed.

Reproductive system. One pair of testes in segment 11. ciliated rosettes opening in the same segment.

Spermiducal glands, small, coiled, tubular, in segment 18.

Sperm sacs, racemose, attached to the anterior wall of segment 12.

Spermathecae, in segments 8 and 9. Each consists of a long sac with a very small blunt diverticulum.

Habitat.—Warragul (Victoria). Collected by Mr. T. Steel.

(3). **Megascolides eucalypti**, sp. n. (Figs. 13, 14, 15).
Spirit specimens, length $8\frac{1}{4}$ inches.

Prostomium completely dovetailed into the peristomium.

Clitellum well developed including the posterior two-thirds of segment 13, segments 14, 15, 16, 17, and the anterior two-thirds of segment 18. The anterior part (on segment 13), and the posterior (on segment 18), white and tumid, the intermediate part darker coloured. The mid ventral surface of segments 17 and 18 not included. Accessory copulatory structures in the form of two pairs of papillae at the level of the ventral setae, the front one between segments 18 and 19, the hinder one between segments 19 and 20.

Setæ regularly arranged, two pairs on each side, the setae of each pair close together.

Male pores on papillae on segment 18 at the level of the interval between the ventral pair of setae. Penial setae present. Oviduct pores on segment 14.

Spermathecal pores, two pairs, intersegmental, at the level of the ventralmost setae, between segments 7 and 8, 8 and 9.

Dorsal pores present, the most anterior between segments 4 and 5, though usually the first one visible is further back, often between segments 12 and 13.

Nephridiopores on the very anterior margin of the segments at the level of the third setae on each side, the most anterior one on the anterior margin of segment 5.

Alimentary canal. Gizzard in segment 5, vascular swellings in segments 15 and 16, no true calciferous glands. Large intestine commencing in segment 19.

Blood vascular system. Dorsal vessel single. Hearts in segments 8-12. A well-marked lateral longitudinal vessel in segments 8-19 at the level of the nephridia.

Excretory system, meganephric.

Reproductive system. One pair in segment 11 into which also the ciliated rosettes open.

Spermiducal glands, coiled, tubular in segments 18.

Sperm sacs racemose, attached to the anterior wall of segment 12.

Ovaries in segment 13, into which the oviducts also open.

Spermathecae in segments 8 and 9, each consists of a sacular part with a small mammilated diverticulum at the base of the sac, and a notably long, curved duct.

Habitat. Neerim and S. Warragul, amongst the Gippsland Ranges, Victoria.

(4). **Megascolides tisdalli**, sp. n. (Figs. 16, 17, 18). Spirit specimens $3\frac{1}{3}$ inches long, $\frac{1}{4}$ inch broad.

Prostomium completely dovetailed into the peristomium. Marked by a longitudinal groove, which is continued backwards along the mid dorsal line.

Clitellum well marked, including segments 14-16 and the dorsal part of the hinder half of segment 13 and the anterior half of segment 17. Flesh coloured.

Setae distinct, arranged in two pairs regularly, except at the very hinder end (about the terminal $\frac{1}{4}$ inch), where they are very irregularly scattered, and where there may be as many as 7 on each side, though most usually only 4 are present. In front of this region the ventral pair is placed close to the ventral surface, the lower seta of the outer pair about half way up the side, and the upper seta near to the dorsal surface.

Accessory copulatory structures in the form of three oval glandular patches on the anterior edge of the mid ventral surfaces of segments 9, 10, 11, and of two oval patches between segments 16 and 17.

Male pores on segment 18; penial setae present.

Oviduct pores on segment 14.

Spermathecal pores 5 in number, intersegmental, between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9; at the level of the ventralmost setae.

Dorsal pores present; the first between segments 4 and 5.

Nephridiopores at the level of the third seta on each side.

Alimentary canal. Gizzard in segment 15. Vascular swellings in segments 8 to 13, the posterior ones being more marked than the anterior. Behind segment 13 the oesophagus gradually increases in size until it passes into the large intestine in segment 17. No true calciferous glands.

Blood vascular system. Dorsal vessel single, hearts in segments 7-12, the posterior three being larger than the anterior ones.

Excretory system. Meganephric.

Reproductive system. Testes, two pairs, in segments 10 and 11; ciliated rosettes opening into the same segment.

Spermiducal glands. Coiled, tubular in segments 18-21.

Sperm sacs. Long, finger shaped, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae. Five pairs, in segments 5, 6, 7, 8 and 9. Each consists of a long sac with a short tubular diverticulum.

Habitat. Walhalla, Victoria. Under logs in damp earth. The dorsal surface of the body a dark purple, the ventral dull fleshy brown; the clitellum flesh colour.

(5). **Megascolides punctatus**, sp. n. (Figs. 19, 20, 21).

Spirit specimens 5 inches long, $\frac{1}{8}$ inch broad.

Prostomium completely dovetailed into the peristomium.

Clitellum well marked, extending over segments 14-16.

Accessory copulatory structures very distinct; two pairs of prominent oval, white, glandular patches, one at the very posterior margin of segment 7 ventrally, and the other on segment 8. Small glandular patches (Fig. 19) ventrally on segments 16-21.

Setae. Two pairs on each side, regularly arranged, except at the posterior end The upper seta of the outer pair gradually assumes a more dorsal position towards the hinder end of the body, when it comes to lie close to the mid dorsal line. At the hinder end of the body the arrangement of all the setae is irregular.

Male pores on papillae on segment 18 at the level of the interval between the two ventral setae.

Oviduct pores on an oval glandular patch on the anterior margin, ventrally, of segment 14.

Spermathecal pores, 4 pairs, intersegmental at the level of the ventralmost setae between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8.

Dorsal pores present ; the first between segments 3 and 4.

Nephridiopores on the anterior margin of the segments at the level of the third seta. The first on segment 1.

Alimentary canal. Gizzard in segment 5. Vascular swellings on the oesophagus in segments 13, 14 and 15. No true calciferous glands. Large intestine, commencing in segment 18.

Blood vascular system. Dorsal vessel single; hearts in segments 5-13.

Excretory system. Meganephric. Peptonephridia in well marked groups in segments 2, 3 and 4.

Reproductive system. Testes, two pairs, in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, coiled, tubular, in segments 18 and 19.

Sperm sacs. Racemose, attached to the posterior wall of segment 9 and the anterior of segment 12.

Oviducts in segment 13, into which the oviducts open.

Spermathecae, 4 pairs; each consists of a long sac and very short diverticulum.

Habitat. Warrandyte, Victoria. Under logs. On each segment in front of the clitellum just below the third seta on each side in a distinct brown spot.

(6). **Megascolides warragulensis**, sp., n. (Figs. 22, 23, 24). Spirit specimens from 4½ to 5½ inches long, $\frac{1}{10}$ inch broad.

Prostomium just wedged into the peristomium with a distinct groove running back along the mid dorsal line of the latter from the apex of the wedge.

Clitellum well developed, extending over the posterior part of segment 13 and over segment 14-18. Ventrally the posterior part of segment 17 and segment 18 are not included. A glandular ridge is present ventrally between segments 18 and 19.

Setae regularly arranged, except at the very posterior end (about 16 segments). Elsewhere the setae of each pair are close together, the outer pair being placed about half way up the side of the body.

Male pores on papillae at the level of the interval between the ventral pairs of setae on segment 18.

Oviduct pores on segment 14.

Spermathecal pores, two pairs, at the level of the ventralmost setae between segments 7 and 8, 8 and 9.

Dorsal pores present; the first between segments 5 and 6.

Alimentary canal. Gizzard in segment 5; no vascular swellings or calciferous glands; large intestine commencing in segment 19.

Blood vascular system. Dorsal vessel single; hearts in segments 8-12.

Excretory system. Meganephric.

Reproductive system. Testes, two pairs, in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands. Coiled, tubular; in segment 18; a large mass of glandular tissue in the mid ventral line between the two glands.

Sperm sacs. Racemose, attached to the anterior wall of segment 12.

Spermathecae, two pairs, each consisting of a sac with a very small mammilated diverticulum close to the body wall.

Habitat. S. Warragul, Victoria.

(7). **Megascolides volvens**, sp. n. (Figs. 25, 26, 27.)
Spirit specimen 3-4 inches long, $\frac{1}{8}$ inch broad.

Prostomium completely dovetailed into the peristomium.

Clitellum well developed, extending over segments 14-16.

Accessory copulatory structures; an oval patch between segments 17 and 18 at the level of the outer of the ventral pair of setae; another at the same level between segments 18 and 19, and another at the level of the ventralmost setae between segments 19 and 20. None of them are strongly marked.

Setae, 4 on each side, regularly arranged, except in the last 25 segments. In front of the clitellum the ventral pair are close

together, the upper two are wide apart; behind the clitellum the ventral pair are further apart, while the third seta is placed more dorsally so as to reduce the interval between it and the fourth seta. In the last 25 segments the setae are arranged very irregularly and there may be as many as 5 on each side.

Male pores on papillae on segment 18.

Oviduct pores on segment 14.

Spermathecal pores five in number; at the level of the ventralmost setae between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Nephridiopores at the level of the third setae.

Alimentary canal. Gizzard in segment 5; vascular swellings in segments 10, 11, 12. No true calciferous glands.

Blood vascular system. Dorsal vessel single; hearts in segments 6-12.

Excretory system. Meganephric.

Reproductive system. Testes in segments 10 and 11, the ciliated rosettes opening in the same segments.

Spermiducal glands, long, coiled, tubular, extending over segments 18-27.

Sperm sacs, lobate; attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, 5 pairs, in segments 5-9, each consisting of a sac and tubular diverticulum three-quarters the length of the sac.

Habitat. Gullies amongst the ranges near the source of the River Yarra, Victoria. (Collected by Mr. C. Frost.)

Cryptodrilus, Fletcher.

(1). **Cryptodrilus shephardi** sp. n. (Figs. 28, 29, 30.)

Spirit specimens $6\frac{1}{4}$ inches long, $\frac{1}{4}$ inch broad.

Prostomium scarcely at all dovetailed into the peristomium.

Clitellum extending over segments 14-16. A deep depression (in spirit specimens) occupying the mid ventral surface of segments 17 and 18. Accessory copulatory structures in the form of small oval patches ventrally on segments 18 and 10; inconspicuous.

Setae regularly arranged; the ventral interval equal to that between the two setae of the lower pair; that between the two upper setae equal to the distance between the lower of these two and the upper of the ventral pair.

Male pores on strongly marked papillae on segment 18.

Oviduct pores on segment 14.

Spermathecal pores, three pairs at the level of the outer setae of the ventral pair between segments 6 and 7, 7 and 8, 8 and 9.

Dorsal pores present, the first between segments 6 and 7.

Alimentary canal. Gizzard in segment 5. Calciferous glands in segments 10-13. Large intestine commencing in segment 15.

Circulatory system. Hearts in segments 7-13. A supra-intestinal in addition to the dorsal vessel present in segments 9-13.

Excretory system, meganephric. A saccular structure present attached to alternate septa possibly connected with the nephridia.

Reproductive system. Testes in segments 10 and 11 into which the rosettes open.

Spermiducal glands flattened, mammilated, bilobate, each lobe with its duct and the two uniting to form a common duct.

Sperm sacs, racemose, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae. Three pairs, each consisting of a spherical sac with a long duct into the base of which open a short tubular diverticulum with a slightly swollen end. In segments 7, 8, and 9.

Habitat. Horsham, Victoria. (Collected by Mr. J. Shephard).

(2). **Cryptodrilus queenslandica**, sp. n. (Figs. 31, 32, 33).

Spirit specimens 18 inches long, ½ inch broad.

Prostomium not at all dovetailed into the peristomium, back as far as the clitellum there are four annuli to each segment, in the clitellar and posterior region there are two to each segment.

Clitellum well marked and dark purple in colour extending over segments 13-20 but not including ventrally segments 17-20.

Setae, two pairs on each side, those of each pair close together and both pairs placed low down on the segment. Difficult to see

except in the clitellar region: behind this they appear to be somewhat irregular.

Male pores on papillae on segment 18 at the level of the interval between the setae of the ventral pair.

Oviduct pores on segment 14.

Spermathecal pores, two pairs, intersegmental between segments 7 and 8, 8 and 9, at the level of the ventralmost setae.

Dorsal pores present, the first between segments 5 and 6.

Alimentary canal. Gizzard in segment 5. In the segment in front of this the walls are dilated but not thickened. Vascular swellings in segments 14 and 15, a pair of calciferous gland in segment 16. Large intestine, commencing in segment 19.

Circulatory system. Dorsal vessel single. Hearts in segments 6-13. Two swollen lateral branches pass off on each side to the walls of the calciferous gland.

Excretory system. Plectonephric.

Reproductive system. Testes, two pairs, in segments 10 and 11 into which the rosettes open.

Spermiducal glands, small, lobate, in segment 18.

Sperm sacs, attached to the anterior wall of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, two pairs, each consisting of a somewhat spherical sac with a short, rounded diverticulum.

Habitat. Near Maryborough, Queensland. (Collected by Mr. R. A. O'Brien).

(3). **Cryptodrilus cooraniensis**, sp. n. (Figs. 34, 35, 36).
Spirit specimens 2¾ to 3 inches in length, ⅛ inch broad. Number of segments about 142.

Prostomium completely dovetailed into the peristomium.

Clitellum well marked, extending over segments 14-16. Accessory copulatory structures in the form of glandular patches ventrally on segments 17 and 18; one pair at the level of the interval between the ventral pair of setae on segment 17, and three median patches on segments 17, 18, and 19.

Setae quite regular along the whole length of the body: the ventral pair on each side near to the mid line and close together;

the same width as that between the two of each of these pairs intervenes between the outer of them and the lower of the upper pair, the upper seta being placed half-way between the former and the mid dorsal line.

Male pores on segment 18 on papillae at the level of the interval between the setae of the lower pair.

Oviduct pores on segment 14 on an oval glandular patch.

Spermathecal pores, two pairs, intersegmentally at the level of the ventralmost setae between segments 7 and 8, 8 and 9.

Dorsal pores present; the first between segments 5 and 6.

Nephridiopores clearly marked; the first on the anterior margin of the second segment at the level of the uppermost seta; the pores on segments 3 and 4 occupy the same relative position; those on segments 5, 6, and 7 are at the level of the third seta from the ventral surface, that in segment 8 at the level of the uppermost, that in segment 9 at the level of the second seta from the ventral surface, and so on alternately down the length of the body.

Alimentary canal. Gizzard in segment 5; calciferous glands in segments 11, 12, and 13. Large intestine, commencing in segment 15.

Circulatory system. Dorsal vessel single; hearts in segment 8-13.

Excretory system. Meganephric.

Reproductive system. Testes, two pairs in segments 10 and 11, into which the rosettes open.

Spermiducal glands. Flattened, bilobed, in segment 18; sometimes the gland is not divided into two lobes.

Sperm sacs, lobulate, attached to the posterior wall of segment 9 and the anterior of segment 13. The testes in segments 10 and 11 are enveloped in sacs (sperm reservoirs), which may, when mature, include the rosettes and wrap round the intestine, filling up all the space in the segment.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, two pairs, in segments 8 and 9, each with a spherical sac and tubular diverticulum.

Habitat. Cooran, Queensland. Under logs in palm scrub.

Fletcherodrilus, Michaelsen.

(1). Fletcherodrilus unicus, Fl., var. *major.*

Whilst collecting in the scrub near to Gayndah, in Queensland, I met frequently with normal specimens of *Fletcherodrilus unicus*, burrowing under bark and logs of wood. All of these were of the usual form, with relatively short firm bodies, not exceeding some 6 inches in length, though quite mature. When digging, however, in the same locality, round the base of some Sterculia trees, I met, at a depth of some two or three feet, with what appeared to be a very distinct species. The body was always found coiled into a characteristic knot in an enlargement in the burrow. It was a ruddy purple in colour, very soft, and reached normally the length of two feet or even longer when alive. Upon examining its structure, it proves to be identical with that of the normal *Fl. unicus*, found in the same spot. As the external form and method of burrowing of the two are so distinct, I have distinguished the large, deep burrowing form as a variety.

Megascolex, Templeton.

(1). Megascolex andersoni, sp. n. (Figs. 37, 38, 39).

Spirit specimen $3\frac{1}{4}$ to 5 inches long, $\frac{3}{8}$ inch broad.

Prostomium about three-quarters dovetailed into the peristomium.

Peristomium with a well marked median ventral cleft.

Clitellum well marked, extending over segments 14-17. The ventral surfaces of segments 10 and 11 are marked by prominent white, glandular ridges. Accessory copulatory structures in the form of two white glandular ridges ventrally on segments 19 and 20.

Setae in front of the clitellum, 14-19 on each side. In the middle of the body, 12-14, and at the posterior end, 18.

Male pores or papillae on segment 18, at the level of the ventralmost setae. Each papilla is at the ventral end of a swollen ridge on segment 18.

Oviduct pores on segment 14.

Spermathecal pores. Three pairs between segments 6 and 7, 7 and 8, 8 and 9, just dorsal to the level of the ventralmost setae.

Dorsal pores present, the first between segments 4 and 5.

Alimentary canal. Gizzard in segment 5. Calciferous glands in segments 10, 11, 12. Large intestine, commencing in segment 15.

Circulatory system. Dorsal vessel single, with a sub-dorsal vessel in segments 8-12. Heart in segments 8-12.

Excretory system. Plectonephric.

Reproductive system. Testes in segments 10 and 11, into which the rosettes open.

Spermiducal glands small, flattened, lobate, in segment 18.

Sperm sacs lobate, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae. Three pairs in segments 7, 8 and 9, each with an elongate sac and tubular diverticulum nearly as long as the sac.

Habitat. Gerangamete, Victoria.

(2). **Megascolex larpentensis**, sp. n. (Figs. 40, 41, 42).

Spirit specimens $2\frac{1}{2}$ inches long, $\frac{1}{16}$ inch broad.

Prostomium completely dovetailed into the peristomium. Marked by a median cleft.

Peristomium with a median longitudinal cleft.

Clitellum extending over segments 14-16 and the anterior part of 17.

Setae in front of clitellum, 14-15 on each side. In the middle of the body as many as 17, and at the posterior end about 12.

Male pores on a small papillae between the ventral pair of setae on each side.

Oviducal pores on segment 14.

Spermathecal pores between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9, at the level of the interval between the two ventral setae on each side.

Dorsal pores present. The first between segments 3 and 4.

Alimentary canal. Gizzard in segment 5. Calciferous glands in segments 10, 11, and 12. Large intestine, commencing in segment 15.

Circulatory system. Dorsal vessel single; hearts in segments 7-12.

Excretory system. Plectonephric.

Reproductive system. Testes, two pairs in segments 10 and 11, into which the rosettes open.

Spermiducal glands, small flattened, with a larger and smaller lobe ; in segment 18.

Sperm sacs, not visible.

Ovaries in segment 13, into which the oviduct opens.

Spermathecae, five pairs, in segments 5, 6, 7, 8, and 9, each consisting of a sac with a tubular diverticulum longer than the sac.

Habitat. Gerangamete, Victoria.

(3). **Megascolex fardyi**, sp. n. (Figs. 43, 44, 45). Spirit specimens 1-2 inches long, $\frac{1}{16}$ inch broad.

Prostomium completely dovetailed into the peristomium.

Peristomium with a median ventral cleft.

Clitellum extending over segments 15-18 and the posterior part of segment 14. Accessory copulatory structures; two pairs of white oval glandular patches, on which the three ventral setae are inserted on segments 10 and 11 ; a pair of glandular patches ventrally on segment 17, and another on segment 19.

Setae, 10-12 on each side in front of the clitellum; 12 behind the clitellum.

Male pores on papillae between the ventral pair of setae on each side in segmeet 18.

Oviduct pores on segment 14.

Spermathecal pores, 4 pairs at the level of the interval between the two ventral setae on each side between segments 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Dorsal pores present, the first between segments 4 and 5.

Alimentary canal. Gizzard in segment 5; three pairs of calciferous glands in segments 10, 11, 12; large intestine, commencing in segment 17.

Circulatory system. Dorsal vessel single; hearts in segments 7-12.

Excretory system. Plectonephric.

Reproductive system, 2 pairs of testes, in segments 10 and 11, into which the rosettes open.

Spermiducal glands, small, flattened, lobulate, in segment 18.

Sperm sacs attached to the posterior wall of segment 9 and the anterior of segment 12; lobulate.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, four pairs in segments 6, 7, 8, and 9, each consisting of a small sac and slightly dilated diverticulum.

Habitat. Heathcote, Victoria. Under logs and stones. (Collected by myself and Mr. J. H. Fardy).

(4). **Megascolex pritchardi**, n. sp. (Figs. 46, 47, 48).
Spirit specimen $2\frac{1}{4}$ inches long, $\frac{1}{16}$ inch broad.

Prostomium wedged into the peristomium, about one-half.

Clitellum extending over segments 14-17. Accessory copulatory structures slightly developed, a pair of papillae between segments 18 and 19 and a pair between segments 19 and 20.

Setae comparatively few in number, 6-7 on each side of the segments in front of the clitellum and 6-8 in those behind.

Male pores on papillae in segment 18 at the level of the interval between the two ventral setae of each side.

Oviduct pores on segment 14.

Spermathecal pores. Two pairs, between segments 4 and 5, 5 and 6, at the level of the interval between the two ventral setae on each side.

Dorsal pores, the first between segments 4 and 5.

Alimentary canal. Gizzard in segment 5; large intestine, commencing in segment 19; no vascular swellings or calciferous glands.

Circulatory system. Dorsal vessel single; hearts in segments 6-12.

Excretory system. Meganephric.

Reproductive system. Testes, two pairs in segments 10 and 11.

Spermiducal glands in segment 18; flattened and lobulate, with a long coiled duct.

Sperm sacs, lobulate, attached to the posterior wall of segment 9 and the anterior wall of segments 12 and 14.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, two pairs, in segments 5 and 6; each consisting of a sac with a small, bluntly rounded diverticulum.

Habitat. Mornington, Victoria. (Collected by Mr G. B. Pritchard.)

(5). **Megascolex montanus**, sp. n. (Figs. 49, 50, 51).
Spirit specimens $2\frac{1}{4}$ inches long, $\frac{1}{8}$ inch broad; number of segments 115.

Prostomium about three-quarters dovetailed into the peristomium. Marked by a median groove.

Clitellum well marked, extending over segments 13-17. Accessory copulatory structures in the form of two papillae on the median ventral surface of segments 19 and 20.

Setae, 10 on each side of the segments in front of the clitellum; 8-10 on each side of the segments behind.

Male pores on papillae on segment 18, at the level of the interval between the two ventral setae on each side.

Oviduct pores on segment 14.

Spermathecal pores, two pairs, between segments 7 and 8, 8 and 9, at the level of the interval between the two ventral setae on each side.

Dorsal pores, the first between segments 4 and 5.

Alimentary canal. Gizzard in segment 5. Calciferous glands in segments 10, 11 and 12. Large intestine, commencing in segment 16.

Circulatory system. Dorsal vessel single. Hearts in segments 7-12.

Excretory system, plectonephric.

Reproductive system. Testes, two pairs in segments 10 and 11, with which also the ciliated rosettes open.

Spermiducal glands flattened, small, lobulate, in segment 18.

Sperm sacs racemose, attached to the posterior wall of segment 9, and the anterior of segment 12.

Ovaries in segment 13 into which the oviducts open.

Spermathecae, two pairs, in segments 8 and 9. Each consisting of a sac with a tubular diverticulum nearly as long as the sac.

Habitat. Mount Baw Baw, Victoria. (Collected by Mr. C. Frost).

(6). **Megascolex lobulatus**, sp. n. (Figs. 52, 53, 54).
Spirit specimens $2\frac{1}{2}$ inches long, $\frac{1}{16}$ inch broad.

Prostomium about three-quarters dovetailed into the peristomium, with a median groove.

Peristomium with a median ventral groove.

Clitellum extending over segments 14-16, and the posterior part of 13, white and glandular in appearance. Accessory copulatory structures well developed. Median oval patches on the mid ventral surfaces of segments 7, 8 and 9, a pair at the level of the interval between the two ventral setae of each side in segments 10; a pair at the level of the ventralmost setae in segment 17; a mid ventral one in segment 19, and larger mid ventral ones in segments 20, 21 and 22.

Setae, 8-11 on each side in the segments in front of the clitellum, 12 on each side in the middle and posterior part of the body.

Male pores on papillae in segment 18 at the level of the ventralmost setae.

Oviduct pores on segment 14.

Spermathecal pores, five pairs, between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9, at the level of the interval between the ventral pair of setae on each side.

Dorsal pores, the first between segments 4 and 5.

Alimentary canal. Gizzard in segment 5; calciferous glands in segments 10, 11, and 12; large intestine, commencing in segment 16.

Circulatory system. Dorsal vessel single; a lateral longitudinal vessel on each side in the region of the oesophagus as far back as the calciferous glands; hearts in segments 7-12.

Excretory system. Plectonephric.

Reproductive system. Testes, two pairs in segments 10 and 11, into which, also, the ciliated rosettes open.

Spermiducal glands. Flattened, bilobed, in segment 18.

Sperm sacs. Racemose, attached to the posterior wall of segment 9, and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae. Five pairs, in segments 5-9, each consisting of a sac with a tubular diverticulum nearly as long as the sac.

Habitat. Nar Nar Goon, Victoria.

(7). **Megascolex minor,** sp. n. (Figs. 55, 56, 57). Spirit specimens $1\frac{1}{2}$ to 3 inches long, $\frac{1}{8}$ inch broad.

Prostomium about one-half dovetailed into the peristomium.

Clitellum extending over segments 13-17, though only the posterior part of 13 may be included.

Accessory copulatory structures. Glandular patches ventrally on segments 10, 11 and 12.

Setae with a distinct dorsal and ventral break, 12-16 on each side.

Male pores or papillae on segment 18, at the level of the interval between the two ventral setae on each side.

Oviduct pores on segment 14, very close to the mid ventral line on a white glandular area.

Spermathecal pores. Two pairs, between segments 7 and 8, 8 and 9, at the level of the second seta on each side.

Dorsal pore, the first between segments 5 and 6.

Alimentary canal. Gizzard in segment 3, vascular swellings in segments 8, 9 and 10. No true calciferous glands. Large intestine, beginning in segment 16.

Circulatory system. Single dorsal vessel. Hearts in segments 5-12, those in segments 5-9 smaller than the three last pairs.

Excretory system. Plectonephric.

Reproductive system. Testes, two pairs, in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands. Flattened, bilobed, in segment 18, or may also press forward into segment 17.

Sperm sacs. Racemose, attached to the posterior wall of segment 9, and the anterior of segment 12. Sperm reservoirs may be present in segments 10 and 11, but these do not enclose the rosettes.

Ovaries in segment 14, into which the oviducts open.

Spermathecae, two pairs, in segments 8 and 9; each consists of a sac and tubular diverticulum swollen at its end.

Habitat. Cooran and Gayndah, Queensland.

(8). **Megascolex illidgei**, sp. n. (Figs. 58, 59, 60.) Spirit specimens $2\frac{1}{2}$ inches long, $\frac{1}{8}$ inch broad; the body containing about 88 segments.

Prostomium about one-half dovetailed into the peristomium.

Clitellum, extending over segments 14-16. Accessory copulatory structures, well developed; small patches between the level of the fourth and fifth setae on each side ventrally, on segments

7 and 8; median ventral patches on segments 10-12, and on segment 16; a larger ventral one on segment 17; a pair on segment 19 and a pair on segment 20.

Setae, the dorsal and ventral break, though present is only small. In front of clitellum 14-15 setae on each side.

Male pores on papillae on segment 18.

Oviduct pores on an oval glandular patch on segment 14, close to the mid ventral line.

Spermathecal pores, two pairs, on little oval patches at the level of the interval between the fifth and sixth setae on each side between segments 7 and 8, 8 and 9.

Dorsal pores, the first between segments 3 and 4.

Alimentary canal. Gizzard in segment 5; vascular swellings in segments 10, 11, 12 and 13; no true calciferous glands present; large intestine, commencing in segment 16.

Circulatory system. Single dorsal vessel; hearts in segments 8-13.

Excretory system. Plectonephric.

Reproductive system. Testes, two pairs, in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, flattened, bilobed, in segment 18.

Sperm sacs, racemose, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, two pairs, in segments 8 and 9; each consisting of a tubular sac with a diverticulum about three-quarters the length of the sac.

Habitat. Cooran, Queensland.

(9). Megascolex terangiensis, sp. n.

Prostomium about one-half dovetailed into the peristomium.

Clitellum extending over segments 14-16. Accessory copulatory structures, a pair of glandular patches at the level of the interval between the two ventral setae on each side on segment 17, a small patch just in front of the male opening on each side.

Setae, 7-8 on each side in front of the clitellum.

Male openings on prominent papillae on segment 18 at the level of the interval between the second and third setae.

Oviduct opening on segments 14.

Spermathecal pores close to the mid dorsal line (dorsal of all the setae) between segments 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Alimentary canal, circulatory system, excretory system, and reproductive system similar to those of *M. dorsalis*, except that the spermiducal glands extend over more segments (18-21).

Habitat. Terang, Victoria. The species, as will be seen, is closely allied to *M. dorsalis*, but is very clearly distinct from this and all other species by the unique position (so far as yet known) of the openings of the spermathecal glands.

Diporochaeta, Beddard.

(1). **Diporochaeta davallia**, sp. n. (Figs. 61, 62, 63). Spirit specimens 8 inches long, $\frac{3}{8}$ inches broad; number of segments 158.

Prostomium completely dovetailed into the peristomium.

Clitellum extending over segments 13-17, but not including the ventral parts of segments 16 and 17. Accessory copulatory structures well developed, a pair of glandular patches at the level of the two ventral setae on each, between segments 9 and 10, 15 and 16, 16 and 17, 19 and 20, 20 and 21, 21 and 22, a pair at the level of the most ventral seta on each side, between segments 18 and 19, a pair at the level of the interval between the second and third setae, each side between segments 17 and 18.

Setae. Five on each side in the anterior segments, 9 in segment 18, 10-12 in the next few segments, 14 in the middle of the body, and 12-14 at the posterior end.

Male pores, on segment 18 at the level of the interval between the two ventral setae of each side.

Oviduct pores on segment 14.

Spermathecal pores, 5 pairs, at the level of the most ventral seta of each side, between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Dorsal pores, the first between segments 3 and 4.

Alimentary canal. Gizzard in segment 5; a small vascular swelling in segment 13 and larger ones in segments 14 and 15; no true calciferous glands; large intestine, commencing in segment 17.

Circulatory system. Single dorsal vessel; hearts in segments 7-12.

Excretory system. Meganephric; the nephridiopores at the level of the interval between the fourth and fifth seta from the ventral surface.

Reproductive system. Two pairs of testes, in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, small, coiled, tubular, in segment 18.

Sperm sacs, 2 pairs of lobate ones attached to the anterior wall of segments 12 and 13; one pair of racemose ones attached to the posterior wall of segment 13.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, 5 pairs, in segments 5-9, each consisting of a swollen sac and short diverticulum.

Habitat. Fern Tree Gully, Victoria.

(2). **Diporochaeta mediocincta**, sp. n. (Figs. 64, 65, 66).
Spirit specimens 2½ inches long.

Prostomium slightly dovetailed into peristomium; a distinct median groove both dorsally and ventrally on the peristomium.

Clitellum distinct, extending over segments 14-16. Accessory copulatory structures; a pair of glandular patches ventrally at the level of the second, third, and fourth setae on each side ventrally between segments 17 and 18 and another pair between segments 18 and 19.

Setae, 14-16 on each side in the segments in front of the clitellum; 20-24 on each side behind the clitellum; dorsal and ventral break distinct.

Male pores on segment 18 on papillae at the level of the interval between the two ventral setae on each side.

Oviduct pores on segment 14.

Spermathecal pores, 4 pairs, at the level of the interval between the two ventral setae on each side between segments 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Dorsal pores, the first between segments 5 and 6.

Alimentary canal. Gizzard in segment 5; vascular swellings in segments 12-16; no true calciferous glands; large intestine in segment 20.

Circulatory system. Single dorsal vessel; hearts in segments 6-12.

Excretory system. Meganephric; external openings at the level of the tenth seta from the ventral surface on each side; peptonephridia present.

Reproductive system. Testes, two pairs, in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, tubular, in segment 18.

Sperm sacs, racemose, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which also the oviducts open.

Spermathecae, four pairs, in segments 6, 7, 8, and 9, each consisting of a sac swollen at its end and a tubular diverticulum half the length of the sac.

Habitat. S. Warragul, Gippsland. When alive the worm is dull reddish in colour with the clitellum well marked and cream coloured. The body is flattened out from above downwards.

(3). **Diporochaeta lindti**, sp. n. (Figs. 67, 68, 69). Spirit specimens 3 inches long, $\frac{1}{8}$ inch broad; number of segments 126.

Prostomium completely dovetailed into the peristomium, which has a median ventral furrow.

Clitellum extending over segments 14-16 and the posterior part of 13; accessory copulatory structures; a pair of glandular patches in the median, anterior and posterior surfaces of segments 6, 7, and 8 and in the median anterior surfaces of segments 9 and 10; larger ventral patches between segments 17 and 18, 18 and 19.

Setae, from 6-10 on each side in front of the clitellum, obliterated in the clitellum, behind this usually 12 on each side, at the posterior end the ventral break is very small indeed.

Male pores on segment 18 at the level of the interval between the two ventral setae on each side.

Oviduct pores on segment 14.

Spermathecal pores, 5 pairs, at the level of the interval between the two ventral setae on each side between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Dorsal pores, the first between segments 3 and 4.

Alimentary canal.. Gizzard in segment 5; vascular swellings in segments 10-12; no true calciferous glands present; large intestine, commencing in segment 17; a white, swollen, twisted part in segment 15.

Circulatory system. Dorsal vessel single; hearts in segments 6-12.

Excretory system. Meganephric; the nephridiopores at the level of the sixth seta from the ventral surface.

Reproductive system. Two pairs of testes, in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, small, coiled, tubular, in segment 18.

Sperm sacs, racemose, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, 5 pairs, in segments 5-9, each consisting of a spherical sac with a duct to which a small diverticulum with a swollen end is attached.

Habitat. Blacks Spur, Victoria. Under logs at an elevation of 2000 feet.

(4). **Diporochaeta euzona**, sp. n. (Figs. 70, 71, 72.) Spirit specimens 6 inches long, $\frac{1}{2}$ inch broad.

Prostomium scarcely at all dovetailed into the peristomium.

Clitellum extending over segments 15-19 and the posterior part of segment 14, except in the mid ventral area of segments 17-19 and the posterior part of segment 16. Accessory copulatory structures in the form of elongate, oval, glandular patches ventrally between segments 17 and 18, 18 and 19, 19 and 20, 20 and 21, the patches being united by ridges across the mid ventral line.

Setae, 18-20 on each side behind the clitellum; about 15 on each side in front of the clitellum; distinct dorsal and ventral break, the latter irregular.

Male pores on papillae on segment 18, at the level of the interval between the two ventral setae on each side; the two papillae united by a median ridge.

Oviduct pores on segment 14.

Spermathecal pores, 5 pairs, at the level of the ventral setae on each side, between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Dorsal pores, the first between segments 3 and 4.

Alimentary canal. Gizzard in segment 5; vascular swellings in segment 13; no true calciferous glands; large intestine, commencing in segment 17.

Circulatory system. Dorsal vessel single; hearts in segments 6-12; a lateral, longitudinal vessel in segments 6-9, breaking up anteriorly into branches over the gizzard.

Excretory system. Meganephric; the nephridiopores at the level of the 12th or the 13th setae from the ventral surface on each side.

Reproductive system. Testes, two pairs, in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, tubular, coiled, in segments 18-22.

Sperm sacs, lobate, attached to the posterior wall of segment 9 and the anterior of segments 12 and 13.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, 5 pairs, in segments 5-9, each consisting of a swollen sac and a very short, tubular diverticulum.

Habitat. Warrandyte, Victoria. (Collected by Mr. C. M. Maplestone).

(5). **Diporochaeta telopea**, sp. n. (Figs. 73, 74, 75). Spirit specimens 2 inches long, nearly $\frac{1}{8}$ inch broad.

Prostomium about three-quarters dovetailed into the peristomium.

Clitellum extending over segments 14-16 and the posterior part of 13. Accessory copulatory structures; a pair of glandular patches ventrally between segments 16 and 17, 17 and 18, 18 and 19.

Setae, 8 or 9 on each side in front of the clitellum; 12 on each side in the middle of the body and 16-18 posteriorly.

Male pores on papillae, on segment 18, at the level of the second setae from the mid ventral line.

Oviduct pores on segment 14.

Dorsal pores present; difficult to see; the first between segments 4 and 5 (?).

Spermathecal pores, 5 pairs, at the level of the ventral seta on each side, between segment 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Alimentary canal. Gizzard in segment 5; vascular swellings in segments 14-16; no true calciferous glands; large intestine, commencing in segment 17.

Circulatory system. Single dorsal vessel; hearts in segments 6-12.

Excretory system. Meganephric.

Reproductive system. Testes, two pairs, in segments 10 and 11, into which also the ciliated rosettes open.

Spermiducal glands, lobate, attached to the posterior wall of segment 9 and the anterior of 12; sperm reservoirs in segments 10 and 11.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, 5 pairs, in segments 5-9, each consisting of an elongate, tubular sac and a tubular diverticulum, which increases in absolute and relative length in the posterior spermathecae.

Habitat. Waratah Bay, Victoria. (Collected by Mr. W. Mann).

(6). **Diporochaeta notabilis**, sp. n. (Figs. 76, 77, 78).
Spirit specimens 2¼ inches long, ⅛ inch broad.

Prostomium about three-quarters dovetailed into the peristomium.

Clitellum extending over segments 14-16; accessory copulatory structures; a glandular patch on the anterior part of segment 10, ventrally at the level of the interval between the two ventral setae on each side; glandular patches ventrally on segments 17 and 19.

Setae, 10-12 on each side all along the body.

Male pores on papillae on segment 18 at the level of the interval between the two ventral setae on each side.

Spermathecal pores; one pair, at the level of the interval between the two ventral setae on each side, between segments 7 and 8.

Dorsal pores, the first between segments 4 and 5.

Alimentary canal. Gizzard in segment 5; true calciferous glands in segments 10-13; large intestine, commencing in segment 16.

Circulatory system. Dorsal vessel single; hearts in segments 7-12.

Excretory system. Plectonephric; peptonephridia present.

Reproductive system. Two pairs of testes in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, coiled, tubular, in segment 18.

Sperm sacs, racemose, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, a single pair in segment 8, consisting of a long tubular sac and a long tubular diverticulum.

Habitat. Dimboola, Victoria.

(7). **Diporochaeta richardi**, sp. n. (Figs. 79, 80, 81).
Spirit specimens $3\frac{1}{2}$ inches long, $\frac{1}{8}$ inch broad; number of segments about 122.

Prostomium about two-thirds dovetailed into the peristomium and marked with a median groove.

Clitellum extending over segments 14-16 and the posterior part of 13; incomplete ventrally.

Setae, in front of the clitellum 7-9 on each side; in the middle of the body 10, and posteriorly 13-14; dorsal and ventral break distinct.

Male pores on indistinctly marked papillae on segment 18.

Oviduct pores on segment 14.

Spermathecal pores, 5 pairs, at the level of the ventral setae on each side between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Dorsal pores, the first between segments 4 and 5.

Alimentary canal. Gizzard in segment 5; vascular swellings in segments 9-14; no true calciferous glands; large intestine, commencing in segment 16.

Circulatory system. Dorsal vessel single, extending far forwards into the second or third segment; subdorsal vessel in segments 9-12; hearts in segments 8-12.

Excretory system. Meganephric. Peptonephridia present.

Reproductive system. Two of pairs testes in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, coiled, tubular, in segments 18 and 19, the duct long and coiled.

Sperm sacs, lobate, finger-shaped, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, five pairs in segments 5-9.

Habitat. Loch, Gippsland, Victoria.

(8). **Diporochaeta nemoralis**, sp. n. (Figs. 82, 83, 84).

Spirit specimens 2½ to 3 inches long, ⅛ inch broad.

Prostomium about half dovetailed into the peristomium.

Clitellum extending over segments 14-16 and the posterior part of 13, tumid, almost concealing the setae, and quite concealing the dorsal pores. Accessory copulatory structures, glandular patches at the level of the interval between the two ventral setae on each side between segments 16 and 17 and at the same level on the anterior part of segment 19.

Setae, usual number in front of the clitellum ten on each side; in the middle of the body 11-12, at the posterior end vary much, 11-21: in this part, odd ones may lie very close to the mid dorsal line so that the dorsal break is very irregular and may be scarcely noticeable: elsewhere the dorsal and ventral breaks are distinct.

Male pores on papillae, at the level of the interval between the second and third setae on each side.

Oviduct pores on segment 14.

Spermathecal pores. Five pairs, at the level of the interval between the third and fourth setae on each side from the ventral surface, between segments 4 and 4, 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Dorsal pores. The first between segments 4 and 5.

Alimentary canal. Gizzard in segment 5, no vascular swellings or calciferous glands, large intestine commencing in segment 17.

Circulatory system. Single dorsal vessel, hearts in segments 7-12.

Excretory system. Meganephric.

Reproductive system. Two pairs testes in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, coiled, tubular, in segments 18-21.

Sperm sacs, lobate, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, five pairs in segments 5-9, each consisting of a spherical sac with tubular duct and a short tubular diverticulum.

Habitat. Neerim, Victoria. Under logs in the gum-tree forests.

(9). **Diporochaeta manni**, sp. n. (Figs. 85, 86, 87). Spirit specimens $2\frac{1}{2}$ inches long, nearly $\frac{1}{4}$ inch broad.

Prostomium about half dovetailed into the peristomium.

Clitellum extending over segments 14-16. Accessory copulatory structures, glandular patches at the level of the ventralmost seta on each side on the anterior part of segments 6-9.

Setae. Fourteen on the first setigerous segment, 14-17 in the segments in front of the clitellum, 16-17 in the clitellar segments, 20 in the middle of the body.

Male pores on slight papillae on segment 18 at the level of the interval between the two most ventral setae.

Oviduct pores on segment 14.

Spermathecal pores at the level of the ventralmost setae, between segments 4 and 5, 5 and 6, 6 and 6, 7 and 8, 8 and 9.

Dorsal pores. The first between segments 5 and 6.

Alimentary canal. Gizzard in segment 5, remarkable racemose glands in segments 5-9, one pair in each segment. The duct appears to enter the canal in the segment in front of that in which the gland lies. Vascular swellings in segments 12-16, large intestine commencing in segment 19.

Circulatory system. Single dorsal vessel; a sub-dorsal vessel in segments 8-13; hearts in segments 6-12; in close relationship with the glands of the alimentary canal.

Excretory system. Meganephric. The nephridiopores distinct, the first being placed on the second segment. In the front of the clitellum they lie at the level of the eleventh setae, in the middle

of the body at the level of the fourteenth setae, and in the last 20 segments close to the dorsal line; in the last 12 segments they correspond in position with the most dorsal setae.

Reproductive system. Two pairs testes in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, coiled, tubular, in segments 18 and 19.

Sperm sacs, racemose, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, five pairs, in segments 5-9, each consisting of a spherical sac with a tubular diverticulum.

Habitat. S. Warragul, Gippsland, Victoria. (Collected by Mr. W. Mann.)

(10). **Diporochaeta arnoldi**, sp. n. (Figs. 88, 89, 90). Spirit specimens 2½ inches long, ⅛ inch broad; number of segments 120.

Prostomium completely dovetailed into the peristomium, which has a median ventral furrow.

Clitellum extending over segments 14-16; accessory copulatory structures; oval glandular patches in the mid ventral line between segments 7 and 8, 8 and 9, 9 and 10; a similar one between segments 17 and 18.

Setae, in front of and in clitellar region 10-11 on each side, middle of body 12, posterior part 12-14; two ventral rows on each side very straight; distinct dorsal and ventral break.

Male pores, on papillae on segment 18 at the level of the two ventral setae on each side.

Oviduct pores on segment 14.

Spermathecal pores, 5 pairs, at the level of the ventralmost setae on each side, between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Dorsal pores, the first between segments 4 and 5.

Alimentary canal. Gizzard in segment 5; no vascular swellings or true calciferous glands; large intestine, commencing in segment 18.

Circulatory system. Single dorsal vessel; sub-dorsal vessel in segments 9-13; hearts in segments 9-12.

Excretory system. Meganephric; the nephridiopores at the level of the sixth setae; the first on the third segment.

Reproductive system. Two pairs of testes in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, coiled, tubular, in segments 18 and 19.

Sperm sacs, lobate, attached to the anterior walls of segments 11 and 12.

Ovaries in segment 13, into which the oviduct opens.

Spermathecae, 5 pairs, in segments 5-9, each consisting of a tubular sac and short tubular diverticulum.

Habitat. Mount Arnold, near Marysville, Victoria; under longs and sheets of bark on a small swamp.

(11). **Diporochaeta frosti,** sp. n. (Figs. 91, 92, 93).
Spirit specimens $1\frac{3}{4}$ inches long, $\frac{1}{8}$ inch broad.

Prostomium completely dovetailed into the peristomium, which has a median ventral furrow.

Clitellum extending over segments 14-16; dark purple tumid; accessory copulatory structures; oval glandular patches in the mid ventral line between segments 5 and 6, 6 and 7, 7 and 8, 8 and 9; three in the mid ventral line between segments 16 and 17, 17 and 18, 18 and 19, and two in the mid ventral line between segments 19 and 20.

Setae, 12 on each side in front of the clitellum, 13-14 in the middle of the body, and 14 posteriorly; dorsal and ventral break distinct.

Male pores on papillae on segment 18 at the level of the interval between the two ventral setae on each side.

Oviduct pores on segment 14.

Spermathecal pores, 4 pairs, opening just dorsal at the level of the ventralmost setae between segments 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Dorsal pores, the first between segments 4 and 5.

Alimentary canal. Gizzard in segment 5; no vascular swellings or calciferous glands; a curious, large, swollen, white coil in segment 15; large intestine, commencing in segment 18.

Circulatory system. Dorsal vessel single; hearts in segments 8-12.

Excretory system. Meganephric; the nephridiopores at the level of the seventh seta from the ventral surface; the first on the third segment.

Reproductive system. Two pairs of testes in segments 10 and 11, into which open the ciliated rosettes.

Spermiducal glands, coiled, tubular, in segments 18 and 19.

Sperm sacs, racemose, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae. Four pairs in segments 6-9, each consisting of a sac and tubular diverticulum.

Habitat. Mount Baw Baw, Victoria. (Collected by Mr. C. Frost).

(12). **Diporochaeta grandis**, sp. n. (Figs. 94, 95, 96). Spirit specimens nearly 10 inches long, about ⅓ inch broad.

Prostomium only very slightly dovetailed into the peristomium; marked by a groove behind which a dark line runs back in the mid dorsal line.

Clitellum very strongly developed and remarkably iridescent, extending over segments 14-18 and the posterior part of 13; no accessory copulatory structures.

Setae, 20-21 on each side of the segments in front of the clitellum, 21-26 along the body behind the clitellum; irregularly arranged dorsally.

Male pores on papillae united by a mid ventral ridge on segment 18 at the level of the interval between the two ventral setae on each side.

Oviduct pores on a small, white, glandular patch on segment 14.

Spermathecal pores, 5 pairs, at the level of the ventral setae on each side, between segments 4 and 5, 5 and 6, 6 and 7, 7 and 8, 8 and 9.

Dorsal pores distinct, the first between segments 1 and 2.

Alimentary canal. Gizzard in segment 5; no vascular swellings or calciferous glands; large intestine, commencing in segment 18.

Circulatory system. Dorsal vessel single; hearts in segments 9-14.

Excretory system. Meganephric; nephridiopores difficult to detect, at the level of the eighteenth seta from the ventral surface.

Reproductive system. Testes, two pairs, in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, small, coiled, tubular, in segment 18.

Sperm sacs, racemose, attached to the posterior wall of segment 9 and the anterior of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, 5 pairs, in segments 5-9, each consisting of a spherical sac with a minute diverticulum.

Habitat. The Upper Endeavour River, Queensland. I am indebted to Mr. C. French and Mr. Dudley le Souëf for specimens of this fine worm, the purple colour of which, together with its remarkably iridescent clitellum, render it very distinct.

(13). **Diporochaeta maplestoni**, sp. n. (Figs. 97, 98, 99). Spirit specimens 6½ inches long, ¼ inch broad; number of segments 185.

Prostomium scarcely at all dovetailed into the peristomium.

Clitellum extending over segments 14-17, but not including the mid ventral part of 17. Accessory copulatory structures, a broad band on segment 19 ventrally.

Setae. Four on each side in front of the clitellum, behind this the number does not appear to exceed 7 on each side.

Male pores on papillae on segment 18.

Female pores on segment 14.

Spermathecal pores. Two pairs at the level of the ventral setae on each side, between segments 7 and 8, 8 and 9.

Dorsal pores. The first between segments 6 and 7.

Alimentary canal. Gizzard in segment 5, vascular swellings in segments 11-13; no true calciferous glands; large intestine commencing in segment 17.

Circulatory system. Dorsal vessel single, hearts in segments 6-12.

Excretory system. Plectonephric. Peptonephridia present.

Reproductive system. One pair of testes in segment 11, into which open the ciliated rosettes.

Spermiducal glands, coiled, tubular, in segment 18.

Sperm sacs, racemose, attached to the anterior wall of segment 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, two pairs, each consisting of a long, bent, tubular sac, with a very short, blunt, diverticulum, in segments 8 and 9.

Habitat. Warrandyte, Victoria. (Collected by Mr. C. M. Maplestone). The number of setae on each side is very few, being usually 6. In front of the clitellum there are two pairs, but behind the clitellum all except the ventral pair are irregularly arranged. This species is doubtfully associated with Diporochaeta.

Digaster, Perrier.

(1). **Digaster minor**, sp. n. (Figs. 100, 101, 102.) Spirit specimens 1½ inches long, less than ⅛ inch broad; about 143 segments.

Prostomium dovetailed about one-half into the peristomium.

Clitellum extending over segments 14-18 and the posterior part of 13; accessory copulatory structures; a broad, glandular patch ventrally on segment 19.

Setae, two pairs on each side regularly arranged, the two of the lateral pair twice as far apart as those of the ventral pair.

Male pores on an oval patch on segment 18 at the level of the ventral seta on each side.

Oviduct pores on segment 14.

Spermathecal pores on small oval patches just ventral of the level of the ventral setae between segments 7 and 8, 8 and 9.

Dorsal pores, the first between segments 7 and 8.

Alimentary canal. Two gizzards in segments 6 and 7; no vascular swellings or calciferous glands; large intestine, commencing in segment 17.

Circulatory system. Dorsal vessel single; hearts in segments 8-12.

Excretory system. Plectonephric.

Reproductive system. Two pairs of testes in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, flattened, bilobed, in segment 18.

Sperm sacs, racemose, attached to the posterior wall of segment 9 and the anterior of segment 11.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, two pairs, in segments 8 and 9, each consisting of a sac and multifid diverticulum.

Habitat. Gayndah, Queensland. Under logs in the scrub.

(2). **Digaster brunneus**, sp. n. (Figs. 103, 104, 105.) Spirit specimens 6 inches long, slightly less than $\frac{1}{4}$ inch broad.

Prostomium not dovetailed into the peristomium.

Clitellum, purple colour, extending over segments 13-19 and the extreme posterior of 12; incomplete ventrally in segments 17-19.

Setae difficult to distinguish.

Male pores on segment 18, apparently at the level of the interval between the setae of the ventral pair.

Oviduct pores on segment 14.

Spermathecal pores, two pairs, apparently at the level of the two ventral setae between segments 7 and 8, 8 and 9.

Alimentary canal. Two gizzards in segments 6 and 7; vascular swellings in segments 15 and 16; large intestine, commencing in segment 18.

Circulatory system. Dorsal vessel single; hearts in segments 6-12.

Excretory system. Plectonephric.

Reproductive system. One pair of testes in segments 11, into which the ciliated rosettes open.

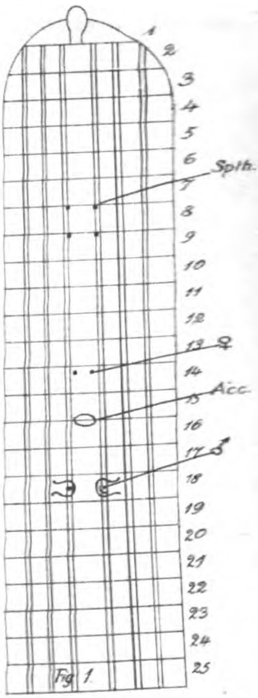
Spermiducal glands, flattened, in segment 18.

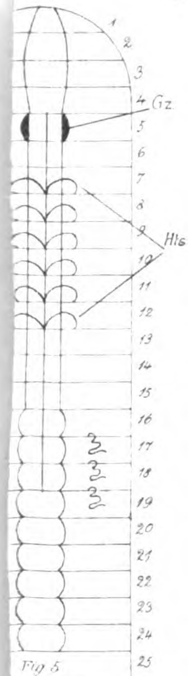
Sperm glands, racemose, attached to the anterior wall of segment 12.

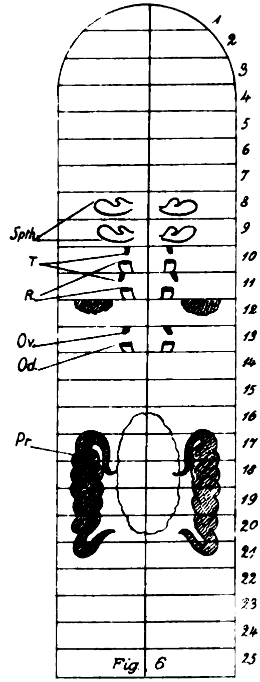
Ovaries in segment 13, into which the oviducts open.

Spermathecae, two pairs, in segments 8 and 9, each consisting of a large sac with a very small double diverticulum.

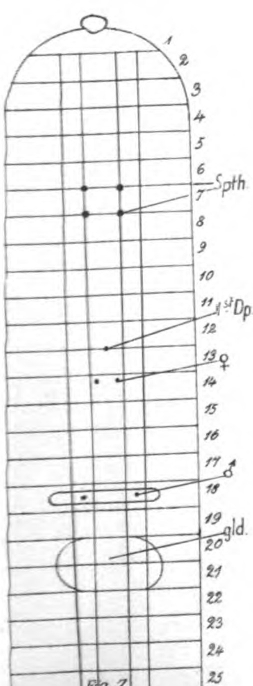
Habitat. Gayndah, Queensland.

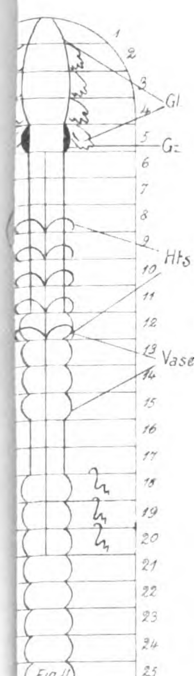


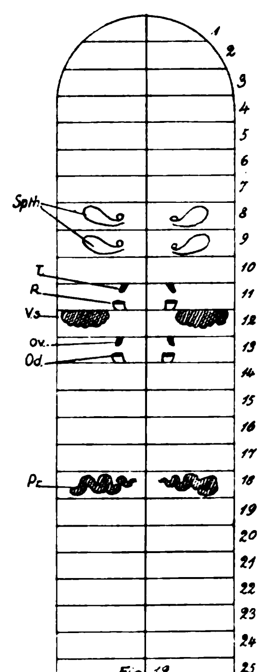




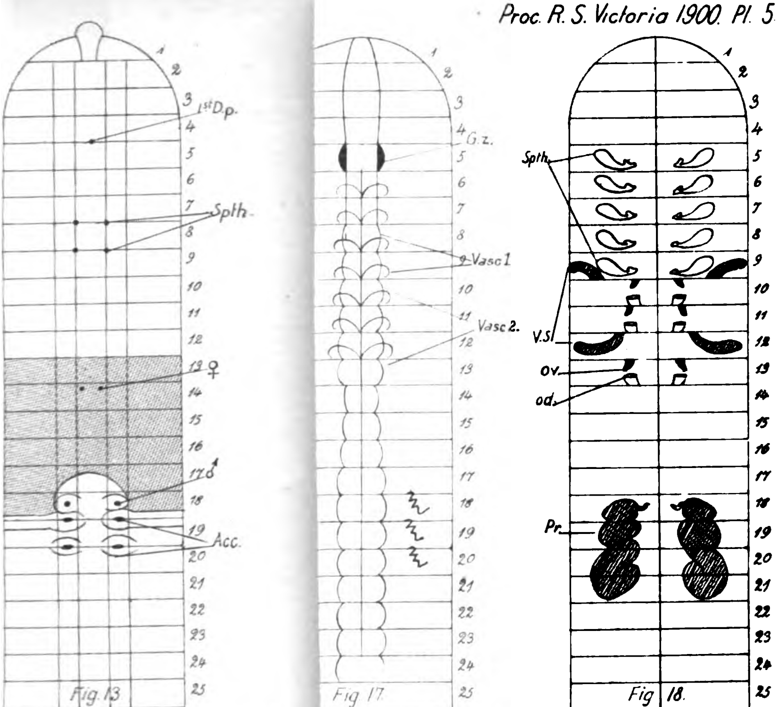
T[illegible]EMA FRAGILIS.



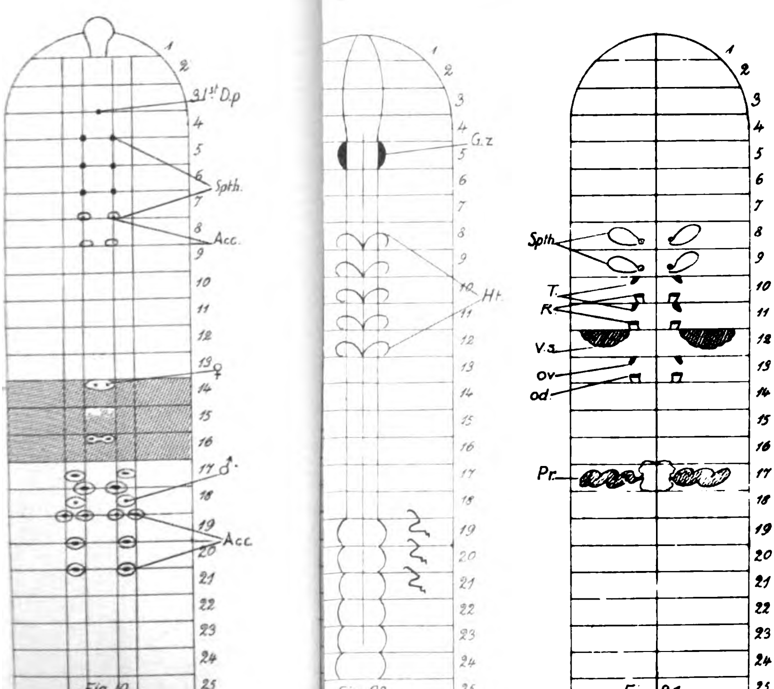




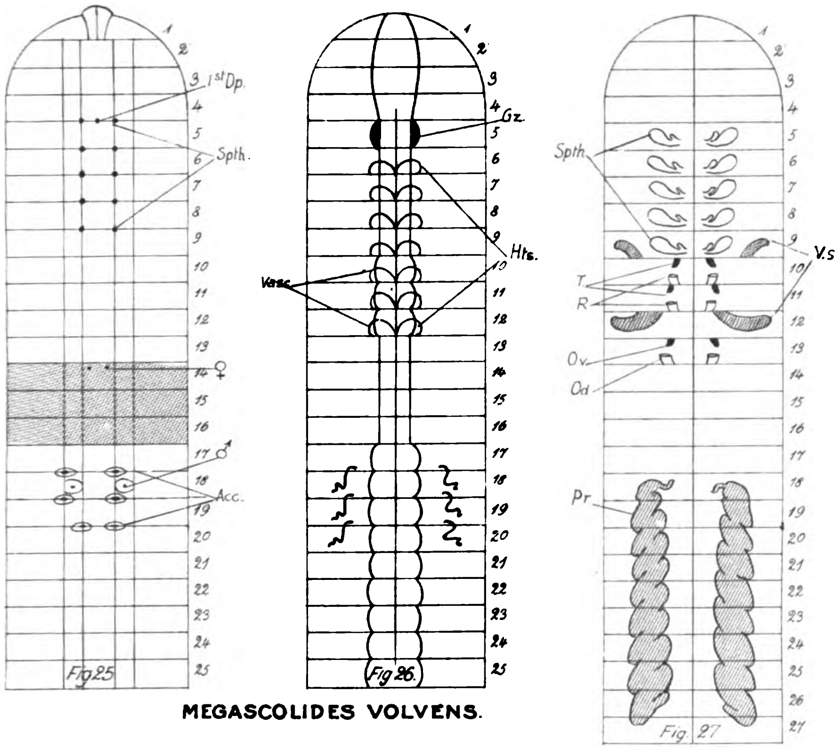
MEGA[illegible]LIDES STEELI.



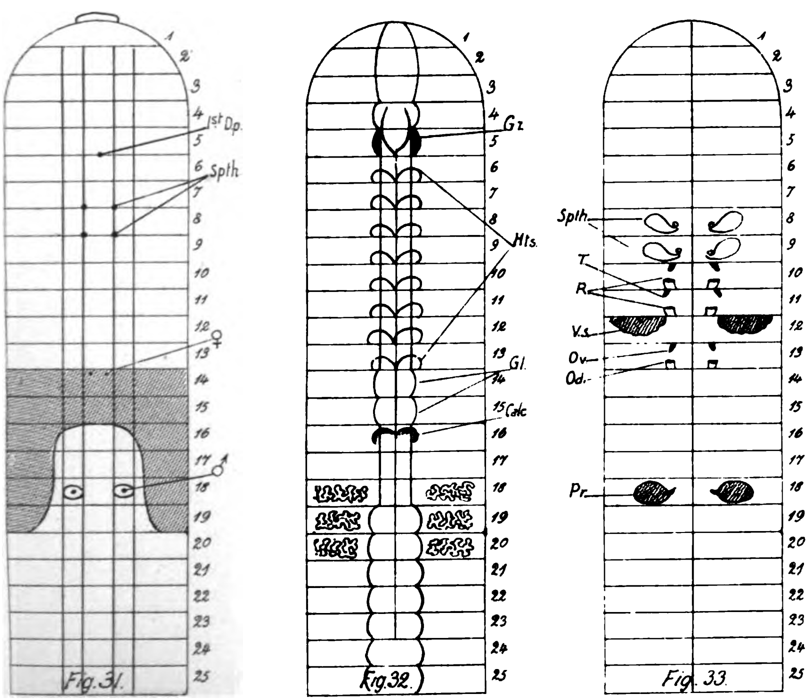
MEGA LIDES TISDALLI.



MEGA ES WARRAGULENSIS.



MEGASCOLIDES VOLVENS.



CRYPTODRILUS QUEENSLANDICA.

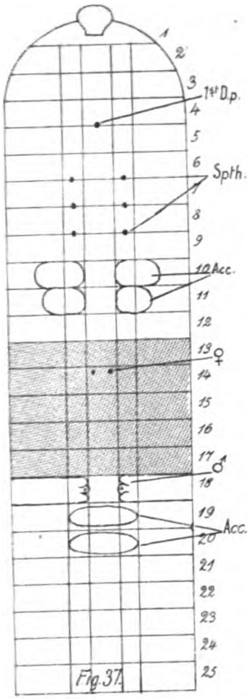
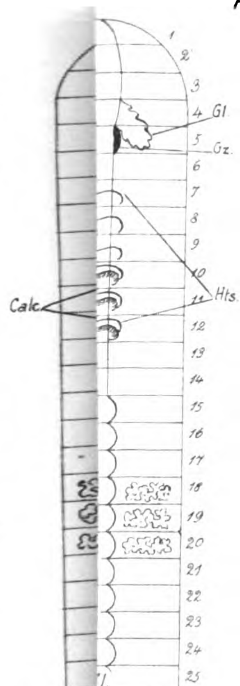


Fig. 37.



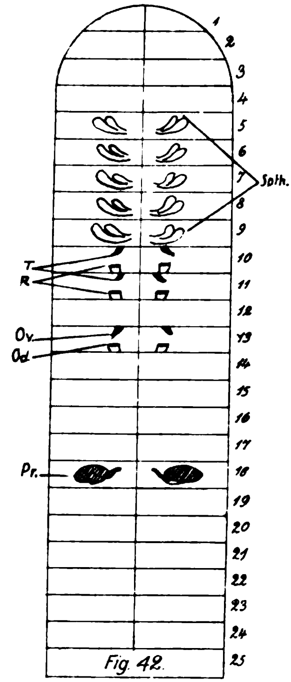


Fig. 42.

MEGASC RPENTENSIS.

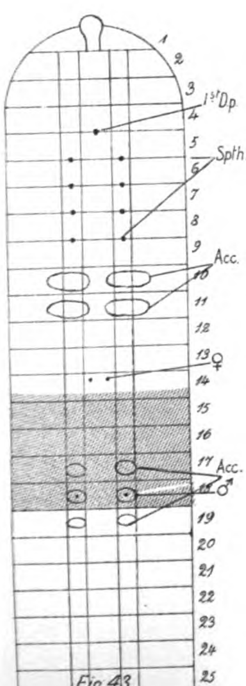
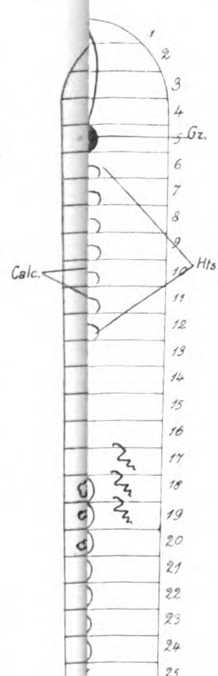


Fig 43.



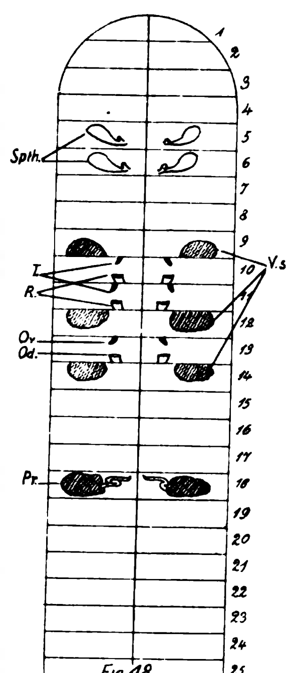


Fig. 48.

MEGARITCHARDI.

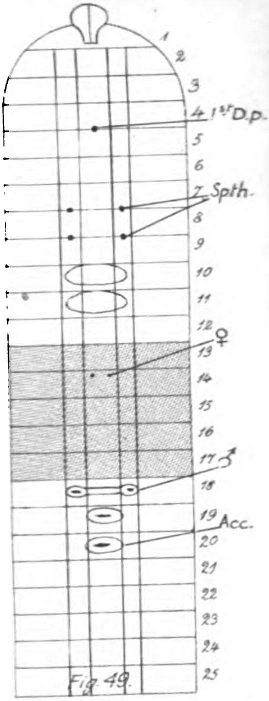


Fig. 49.

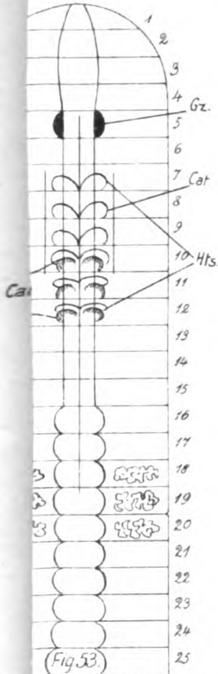


Fig. 53.

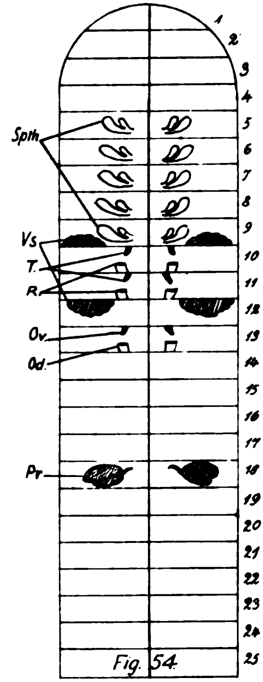


Fig. 54.

MEG LEX LOBULATUS.

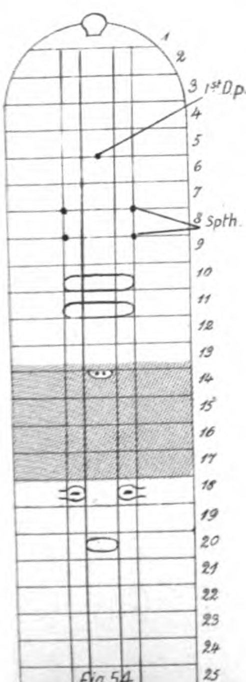


Fig. 54.

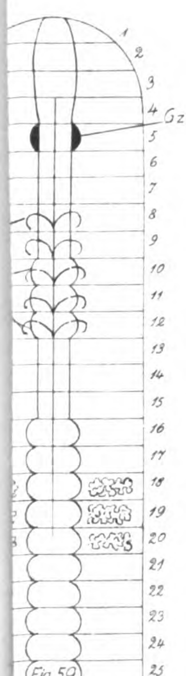


Fig. 59.

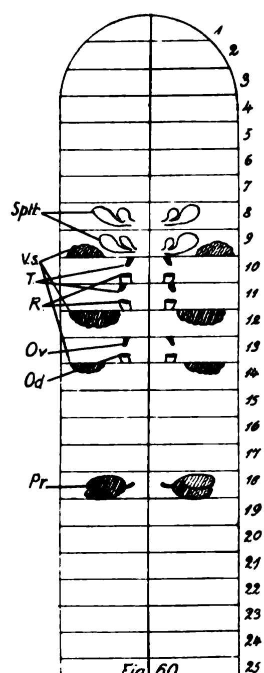
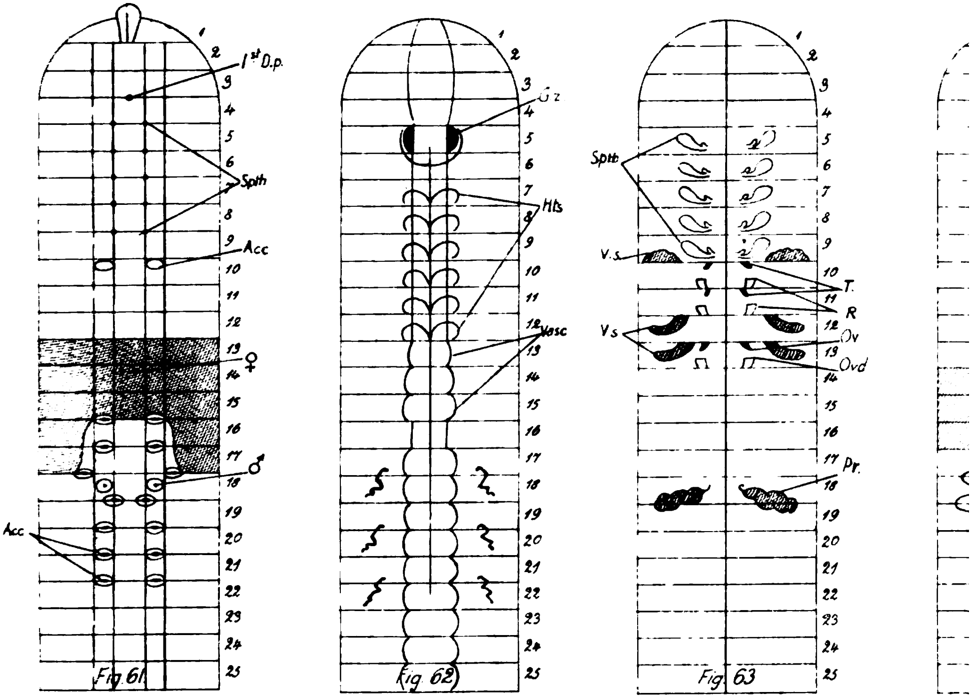
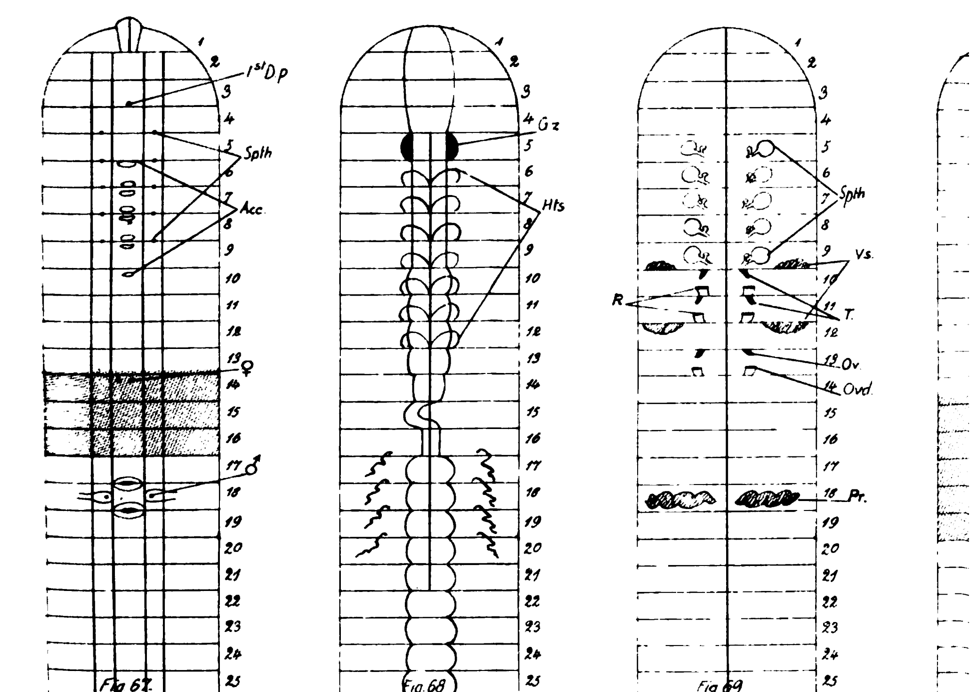


Fig. 60

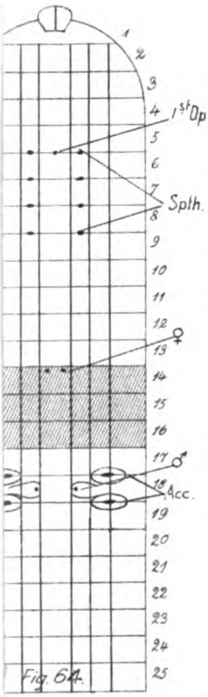
M OLEX ILLIDGEI.

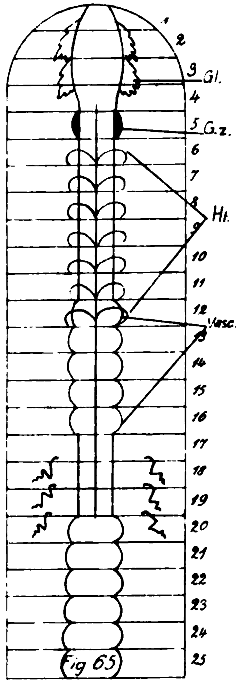


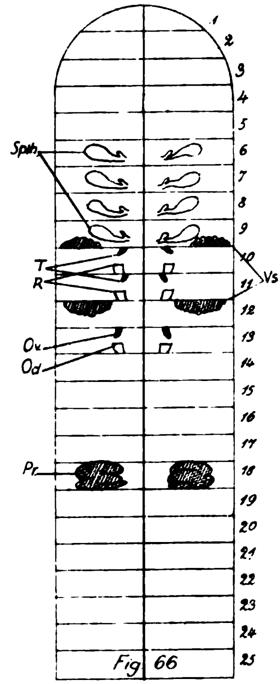
DIPOROCHÆTA DAVALLIA.



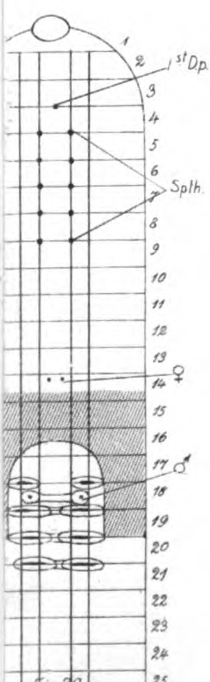
DIPOROCHÆTA LINDTI.

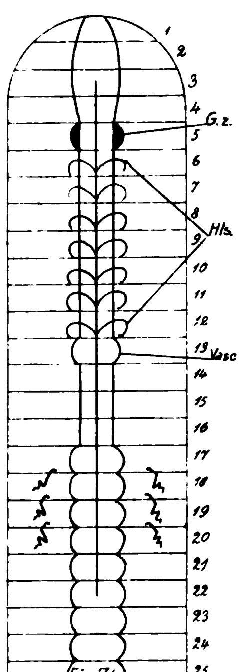


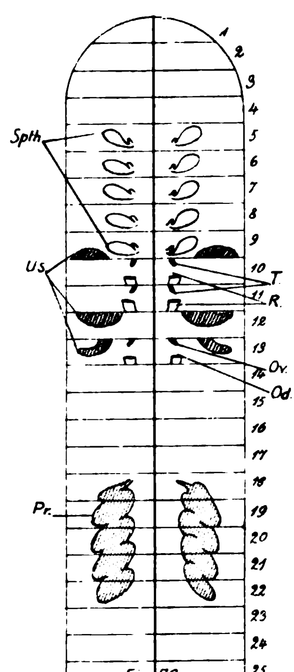




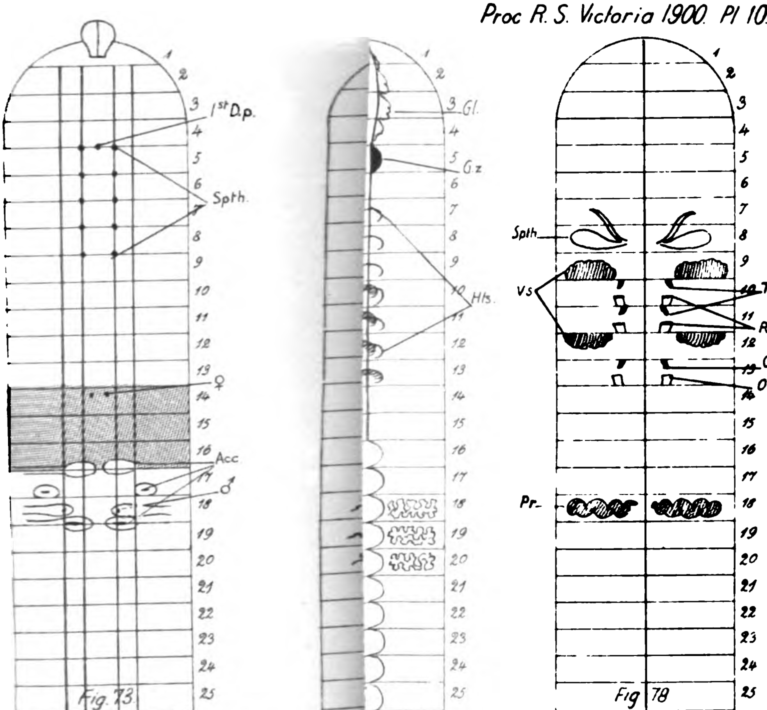
DIPOROCHÆTA MEDIOCINCTA



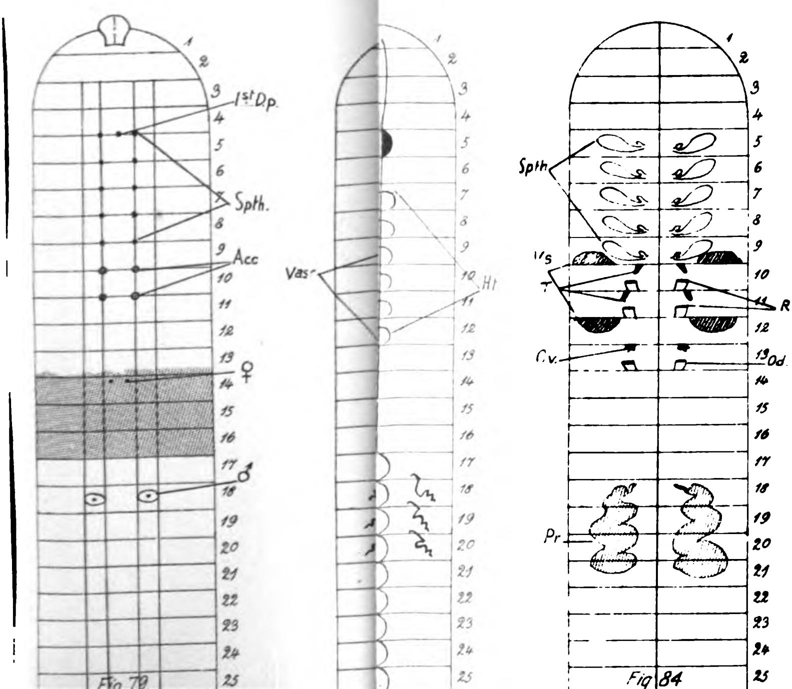




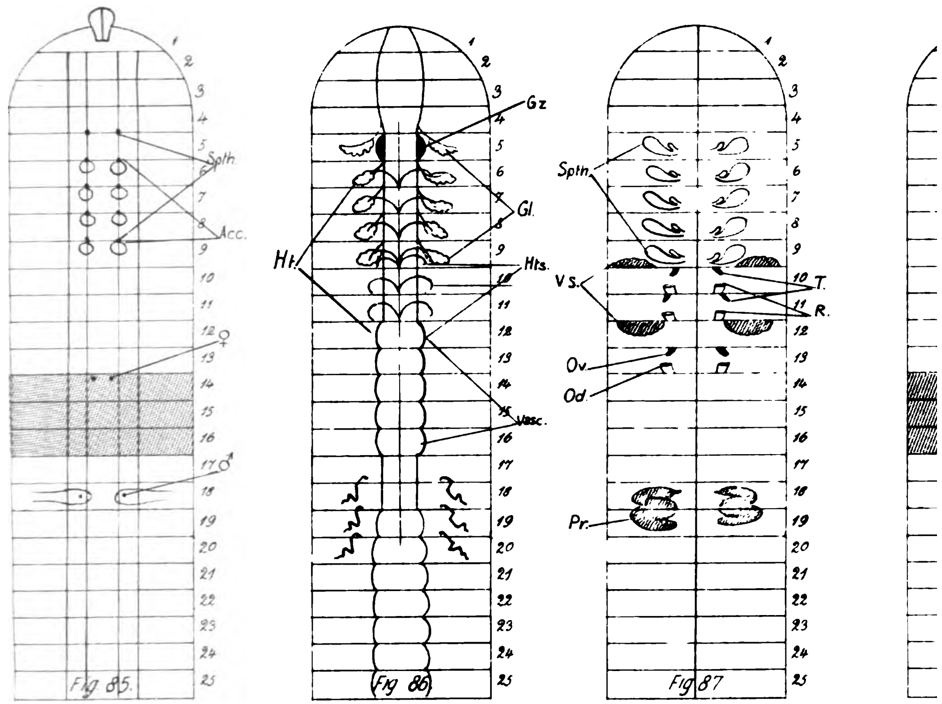
DIPOROCHÆTA EUZONA.



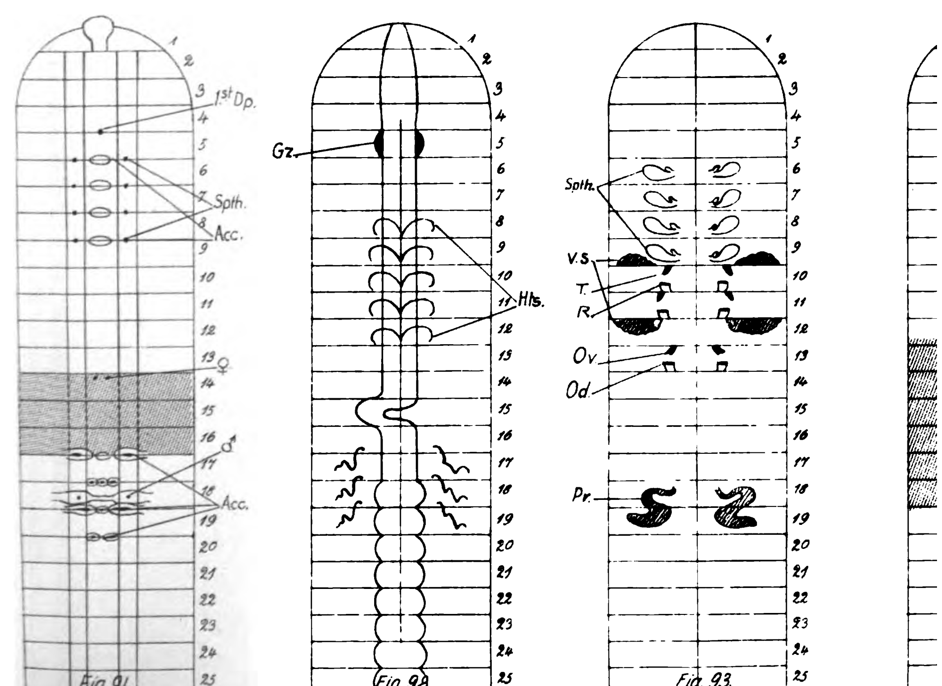
DIPORO NOTABILIS.



DIPOROC NEMORALIS.



DIPOROCHÆTA MANNI.



DIPOROCHÆTA FROSTI.

(3). **Digaster gayndahensis**, sp. n. (Figs. 106, 107, 108.) Spirit specimens $2\frac{1}{4}$ inches long, less than $\frac{1}{4}$ inch broad; number of segments about 102.

Prostomium about one-half dovetailed into the peristomium.

Clitellum extending over segments 14-18 and the posterior part of 13; accessory copulatory structures; median, ventral, glandular patches between segments 19 and 20, 20 and 21, 21 and 22.

Setae difficult to distinguish behind the clitellum; the two of each pair close together in front of the clitellum.

Male pores on a ventral ridge at the level of the interval between the ventral pair of setae.

Oviduct pores on segment 14.

Spermathecal pores at the level of the ventral setae between segments 7 and 8, 8 and 9.

Dorsal pores, the most anterior one which can be seen lies between the 37th and 38th segment from the posterior end.

Alimentary canal. Two gizzards in segments 7 and 8, in segments 5 and 6 the canal is coiled and thin walled; no vascular swellings or calciferous glands; large intestine, commencing in segment 17.

Circulatory system. Dorsal vessel single, hearts in segments 9-13.

Excretory system. Plectonephric.

Reproductive system. Two pairs of testes in segments 10 and 11, into which the ciliated rosettes open.

Spermiducal glands, small, lobate in segment 18.

Sperm sacs, racemose, attached to the anterior walls of segments 11 and 12.

Ovaries in segment 13, into which the oviducts open.

Spermathecae, two pairs, in segments 8 and 9, each consisting of a short sac with a small spherical diverticulum.

Habitat. Gayndah, Queensland

ART. V.—*A Contribution to our Knowledge of the Spiders of Victoria; including some New Species and Genera.*

BY H. R. HOGG, M.A.

(Plates XIII. to XVII.)

[Read 19th April, 1900].

The spiders from my own collection here dealt with have been taken almost wholly about the neighbourhood of Macedon, and may therefore be considered as fairly representative of the central portion of the Dividing Range of the colony of Victoria.

The Australian spiders described by L. Koch and E. von Keyserling, our chief workers in the past, were mostly collected by the agents of Messrs. Godeffroy Brothers of Hamburg, from about their trading stations for produce in Queensland, New South Wales, and the Pacific islands; they also include the work done by Mr. Bradley in New South Wales, Mr. Urquhart in New Zealand, and by Messrs. Thorell and O. P. Cambridge, from desultory specimens, so that the southern portion of the continent has remained more or less unworked.

The Godeffroy collection, unhappily, was broken up some years ago, and no reliance can now be placed on the specimens at times sold by dealers as L. Koch's types, but the National Museum of Victoria has a good representative set of named specimens, purchased many years ago therefrom, reputed to be types. Von Keyserling's collection is in the British Museum, and his types are available for comparison, but the Australian ones are comparatively few in number, so that in determining species written descriptions have to be followed in the large majority of instances, leaving an unsatisfactory margin of liability to error even where, as in this case, they are so minutely and conscientiously detailed.

The illustrations are fortunately very voluminous, and where I have been able to compare them with the originals, I have been imbued with great respect for the accuracy of the work.

In descriptions of new species I have endeavoured to follow as closely as possible Herr Koch's methods, and only venture to hope that later students may find my own as lucid and reliable as I have found his.

In spite of the fact that we have many forms extremely widely spread over Australasia, there are undoubtedly others whose habitat is comparatively local, and different localities seem to develop characteristics which are quite distinguishable.

In these southern coastal districts, we miss the larger members of the various families, as well as the more exaggerated variations from the simple types, which are so numerous in the warmer central and northern portions of the continent.

As examples of this I would instance the larger Nephilae Avicularidae and Philodromidae, as well as the more pronounced forms of Gasteracantha found in the north, of which our southern representatives are smaller and more normal in form.

This suggests the inference that congenial surroundings of life and abundance of food have had a clear influence on the specialisation of members of the various families in the same manner as animals develop size and abnormal shapes under the more easy conditions of domestication.

One special feature of the spider fauna of Australasia seems to be that, while we find on the main continent species located also in New Zealand, Fiji, and other Pacific islands at great distances from our coasts, instances of intercommunity between Australia and the Northern islands, or Asia, are of much more rare occurrence, although the links of land connection are broken by comparatively narrow straits. I except, however, New Guinea and North Queensland, between which, as might be expected, there is considerable interchange, though to what extent we shall not know definitely until more New Guinea material has been worked out.

As far as I can judge at present, Southern Victorian species spread along the coast as far west as King George's Sound in greater abundance than only as far north as across the Murray into Riverina. On the other hand a good many of our species run up the coast-line to Bowen and Townsville, in Queensland.

I say so far as I can judge, because our inland stations require more careful searching than they have yet had before anything like accurate areas for species can be assigned.

Among the sedentary spiders, Latrodectus scelio, Thor., which, as the Katipo, has gained a reputation in New Zealand, is more widely spread probably than any other. I have it from all parts of Victoria, New South Wales, Southern Queensland, Central Australia, Adelaide and Albany. Araneus verrucosus, Walck.; is common in New Zealand and Victoria. Gasteracantha minax, Thor., is abundant from Sydney downwards through Victoria, South Australia, and west to Albany, Arachnura higginsii ranges from Darling Downs, Queensland, through Victoria to Albany, West Australia.

Some of the Laterigrade spiders, Voconia insignis, Thor.; V. dolosa, L. Koch; V. immanis, L. Koch; and Delena cancerides, Walck, are, as might be expected from their powers of locomotion, found in all parts of the continent hitherto searched, but specimens are a good deal larger in the north than in the south.

In my present paper, confined to one district, I have recorded 64 genera and 139 species, in which 6 genera and 29 species are new.

I am not, however, publishing descriptions of any new Saltigrade spiders, as we are awaiting fresh classifications of this group, the Attidae, from M. Eugene Simon, in France, and Dr. and Mrs. Peckham, in America, who have been engaged on them for some time past. The present division of this important group is admittedly imperfect, and von Keyserling's classification of the Australian genera is only tentative.

In spite of the very large number of specimens which M. Eugene Simon must have examined for the arrangement of his genera of the Spiders of the world, a great work never before attempted, it would seem as if he had not had the opportunity of comparing many of our Australian forms. In fairly numerous instances specimens in this collection do not fall in with his synopses. I have noted some of the cases to which I refer, and will endeavour later on to supply a fuller list.

I cannot too gratefully express my thanks to Mr. R. I. Pocock, of the Natural History Museum, South Kensington, and Professor Baldwin Spencer, Director of the National Museum of Victoria, for their ever ready advice and assistance, and the opportunities afforded me by each of them in comparing the types in the collections under their charge.

List of the Spiders of the Macedon District.

Order Araneae.

I.—Sub-order ARANEAE THERAPHOSAE.

Family Avicularidae.

Sub-family Diplurinae.

Group Diplureae.

Genus Brachythele, Auss. (= Aname, L. Koch).

Species pallida, L.K.

Genus Hapalothele, Lenz. (= Ixalus, L. Koch).

Species varius, L.K.

II.—Sub-order ARANEAE VERAE.

Section I.—Cribellatae.

Family Uloboridae.

Sub-family Uloborinæ.

Genus uloborus, Latreille.

Species tenellus (?), L. Koch.

Family Dictynidae.

Genus amaurobius, C. Koch.

Species senilis, L. Koch.

„ chalybeius, L. Koch.

„ robustus, L. Koch.

„ candidus, L. Koch.

„ segestrinus, L. Koch.

„ pilosus, nov. sp.

Genus Badumna, Thor.

Species inornata, L. Koch.

Genus Hylobius, nov. gen.

Species divergens, nov. sp.

„ punctatus, nov. sp.

Section II.—Ecribellatae.

Family Oonopidae.

Group Oonopidae molles.

Genus Macedonia, nov. gen.

Species burchelli, nov. sp.

Genus Gippsicola, nov. gen.

Species raleighi, nov. sp.

Family Drassidae
  Sub-family Hemicloeinae.
    Genus Hemicloea, Thorell.
      Species flavitarsis, L. Koch.
        „ major, L. Koch.
        „ rogenhoferi, L. Koch.
  Sub-family Drassodinae.
    Group Drassodeae.
      Genus Drassodes, Westring.
        Species Silaceus, L. Koch.
          „ Ochropus, L. Koch.
      Genus Drassus, Walck.
        Species debilis, nov. sp.
    Group Lamponeae.
      Genus Lampona, Thorell.
        Species fasciata, L. Koch.
          „ sordida, L. Koch.
          „ cylindrata, L. Koch.
          „ obscaena, L. Koch.
          „ murina, L. Koch.
    Group Gnaphoseae.
      Genus gnaphosoides, nov. gen.
        Species signatus, nov. sp.
Family Zodariidae.
  Sub-family Zodariinae.
    Group Storeneae.
      Genus Storenosoma, nov. gen.
        Species lycosoides, nov. sp.
      Genus Storena.
        Species striatipes, L. Koch.
          „ formosa, Thorell.
          „ spirafer, L. Koch.
          „ macedonensis, nov. sp.
Family Pholcidae.
  Sub-family Pholcinae.
    Group Pholceae.
      Genus Pholcus, Walck.
        Species litoralis (?), L. Koch.

Family THERIDIIDAE.
Group Theridieae.
Genus Theridion.
Species semiflavum, L. Koch.
„ mundulum, L. Koch.
„ decoratum, L. Koch.
„ crinitum, L. Koch.
„ gigantipes, Keys.
Genus Centropelma, L. Koch.
Species bicolor, L. Koch.
Group Dipoeneae.
Genus Latrodectus, Walck.
Species scelio, Thor.
Family ARGIOPIDAE.
Sub-family Tetragnathinae.
Group Tetragnatheae.
Genus Tetragnatha, Latr.
Species cylindrica (?), Walck.
„ panopea (?), L. Koch.
„ mandibulata, Walck.
„ valida, Keys.
Group Meteae.
Genus Meta, C. Koch.
Species trivittata, Keys.
„ Graeffii, Keys.
Sub-family Nephilinae.
Group Nephileae.
Genus Nephila, Leach.
Species venosa, L. Koch.
Sub-family Argiopinae.
Group Argiopeae.
Genus Argiope, Audouin.
Species plana, L. Koch.
„ picta, L. Koch.
„ regalis, L. Koch.
„ syrmatica, L. Koch,
Group Cyrtophoreae.
Genus Cyrtophora, E. Sim.
Species parnasia, L. Koch.

Group Araneae.
  Genus Araneus, Clerck.
    Species biapicatus, L. Koch.
      „ thyridotus, Thorell.
      „ productus, L. Koch.
      „ transmarinus, Keys.
      „ sydneyicus, Keys.
      „ verrucosus, Walck.
      „ fuliginatus, L. Koch.
      „ decolor, L. Koch.
      „ bradleyi, Keys.
      „ phthisicus (?), L. Koch.
      „ psittacinus, L. Koch.
      „ rarus, Keys.
      „ triangulus, Keys.
      „ memorii, nov. sp.
      „ scutigerens, nov. sp.
Group Gasteracantheae.
  Genus Gasteracantha, Sundv.
    Species minax, Thor.
      „ var. astrigera, L. Koch.
      „ „ lugubris, L. Koch.
Group Cyrtarachneae.
  Genus Cyrtarachne, Thor.
    Species latifrons, nov. sp.
      „ latifrons, var. atuberculata.
Group Celaenieae.
  Genus Celaenia, Thorell.
    Species excavata, L. Koch.
      „ dubia (?), Cambr.
Group Arcyeae.
  Genus Arcys, Walck.
    Species clavatus, L. Koch.
  Genus Archemorus.
    Species simsoni (?), E. Sim.
Group Dolophoneae.
  Genus Dolophones, Walck. (=Tholia, L. Koch).
    Species testudineus, L. Koch.
      „ pilosus, Keys,

Species mammeatus, Keys.
„ maximus, nov. sp.

Family THOMISIDAE.
Sub-family Misumeninae.
Group Cymbacheae.
Genus Cymbacha, L. Koch.
Species similis, L. Koch.
Group Coriarachneae.
Genus Tharpyna, L. Koch.
Species diademata, L. Koch.
Group Misumeneae.
Genus Misumena, Latr.
Species lactea, L. Koch.
Group Dioeeae.
Genus Dioea, Thor.
Species daemelii, L. Koch.
Genus Xysticus, C. Koch.
Species cruentatus, L. Koch.
„ autumnalis, L. Koch.
Sub-family Stephanopsinae.
Group Stephanopseae.
Genus Stephanopsis, Cambr.
Species Cambridgei, Thor.
„ trapezia, L. Koch.
„ armata, L. Koch.

Family CLUBIONIDAE.
Sub-family Sparassinae.
Group Sparasseae.
Genus Delena, Walckenaer.
Species cancerides, Walck.
Genus Holconia, Thor. (= Voconia, Thor.).
Species insignis, Thor.
„ immanis, L. Koch.
„ dolosa, L. Koch.
Genus Isopoda, L. Koch.
Species flavida (?), L. Koch.
„ conspersa, L. Koch.
„ aurea (?), L. Koch.

Group Heteropodeae.
Genus Heteropoda, Latr.
Species diana, L. Koch.
" macilenta, L. Koch.
Sub-family Clubioninae.
Group Clubioneae.
Genus Clubiona, Latr.
Species robusta, L. Koch.
" notabilis, L. Koch.
Sub-family Liocraninae.
Group Miturgeae.
Genus Miturga, Thorell.
Species lineata, Thor.
" gilva, L. Koch.
" maculata, nov. sp.
Genus Syspira, E. Simon.
Species rubicunda, nov. sp.
Genus Argoctenus, L. Koch.
Species pictus, L. Koch.
" pectinatus, nov. sp.
Sub-family Corinninae.
Group Corinneae.
Genus Medmassa, E. Sim.
Species pallipes, L. Koch.
" albopunctata, Hogg.
" bicolor, nov. sp.
" fusca, nov. sp.
Family PISAURIDAE.
Sub-family Dolomedeae.
Genus Dolomedes, Latr.
Species australianus, L. Koch.
" instabilis, L. Koch.
Family LYCOSIDAE.
Sub-family Cycloctenease.
Genus Cycloctenus, L. Koch.
Species flaviceps, L. K.
Sub-family Lycoseae.
Genus Lycosa, Latreille.
Species ornatula, L. Koch.

Species ramosa (?), L. Koch (young).
„ expolita, L. Koch.
„ berenice (?), L. Koch.
„ inornata (?), L. Koch.
„ laeta, L. Koch.
„ leucophaea (?), L. Koch (young).
„ godeffroyi, L. Koch.
„ alboguttulata, L. Koch.
Genus Venator, nov. gen.
Species spenceri, nov. sp.
„ fuscus, nov. sp.
„ marginatus, nov. sp.

Family Attidae.
Genus Leptorchestes, Thor.
Species cognatus, L. Koch.
„ nov. sp.
Genus Scirtetes, L. Koch.
Species nov. sp.
Genus Marptusa, Thor.
Species leucocomis, L. Koch.
„ jovialis, L. Koch.
„ melancholica, L. Koch.
Genus Astia, L. Koch.
Species respersa, L. Koch.
Genus Opisthoncus, L. Koch.
Species magnidens, L. Koch.
Genus Ergane, L. Koch.
Species dialeuca, L. Koch.
Genus Prostheclina, Keys.
Species pallida, Keys.
Genus Cytaea, Keys.
Species nov. sp.
Genus Habrocestum, E. Simon.
Species opalescens, nov. sp.
Genus Sinnamora, Keys.
Species semirasa, Keys.
„ nov. sp.
Genus Hadrosoma, Keys.
Species nov. sp.

Genus Plexippus, C. Koch.
Species albopilosus, Keys.
Genus Euophrys, C. Koch.
Species nov. sp.
Genus Lauharulla, Keys.
Species nov. sp.

The New or Little Known Species of the Above List.

Hapalothele varius, L. Koch.

L. Koch gives for the measurement of his specimens from Bowen, Queensland:

Female - - Ceph. - 7 mm. long.
Abd. - 8 „ „

	1st pair.	2nd pair.	3rd pair.	4th pair.
Legs	16 mm.	15 mm.	13 mm.	18 mm.

Palpi - - 10 mm.

Male - - Ceph. - 7 mm. long.
Abd. - 7 „ „

	1st pair.	2nd pair.	3rd pair.	4th pair.
Legs	21½ mm.	19 mm.	16½ mm.	21½ mm.

Palpi - - 11 mm.

In my garden and surrounding paddocks I find numerous fully developed specimens of very different size, but otherwise, apparently, the same.

I give measurement of three:—

Female - Ceph. - 11½ mm. long. - 9½ mm. broad.
Abd. - 17 „ „ - 12 „ „

	Coxa	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1	5½ mm.	9 mm.	10½ mm.	9 mm.	= 34 mm.
2	5 „	8½ „	10 „	9 „	= 32½ „
3	4 „	7½ „	8 „	8½ „	= 28 „
4	4½ „	10 „	11 „	10½ „	= 36 „
				Tarsus.	
Palpi	5 „	7 „	7 „	4 mm.	= 23 „

Female	- Ceph.	- 8 mm. long.	- 6 mm. broad.	
	Abd.	- 8 „ „	- 5 „ „	

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1	- 4 mm.	- 6 mm.	- 6½ mm.	- 5½ mm.	= 22 mm.
2	- 3½ „	- 5½ „	- 5¾ „	- 5½ „	= 20¼ „
3	- 3 „	- 5 „	- 5 „	- 5½ „	= 18½ „
4	- 3½ „	- 6 „	- 6½ „	- 7 „	= 23 „
				Tarsus.	
Palpi	- 3½ „	- 4½ „	- 4½ „	- 3 mm.	= 15½ „

Male	- Ceph.	- 4½ mm. long.	- 3 mm. broad.	
	Abd.	- 6 „ „	- 4 „ „	

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1	- 1½ mm.	- 3 mm.	- 3 mm.	- 3 mm.	= 10½ mm.
2	- 1¼ „	- 3 „	- 3 „	- 2½ „	= 9¾ „
3	- 1¼ „	- 2¾ „	- 2½ „	- 2¾ „	= 9¼ „
4	- 1½ „	- 4 „	- 4 „	- 3½ „	= 13 „

Palpi - - 8 mm.

I have taken adult spiders, notably a Latrodectus scelio, and kept them alive in captivity for periods of up to over two years, during which time they certainly increased in size.

I think it may reasonably be concluded that some of the larger species live for three or possibly four years, which might account for the difference in size.

I have measured adult specimens of Miturga lineata which varied nearly as much as the above.

L. Koch describes two black species of Gasteracantha, G. astrigera and G. lugubris, which differ from G. minax, Thor., firstly in the absence of the characteristic white or yellow markings, in one case from the back only and in the other both upper and under sides, and, secondly, in the size and shape of the spines. On looking over a large number of specimens of G. minax, a numerous and widely spread species, it is quite easy to form a series with spines varying from the most formidable dimensions down to the finer and smaller as described for the black, which are scarcer, though still widely spread. I have no males of the latter, but in the females the genital structure is the same, and I have, therefore, treated them as varieties only of G. minax, with the melanism more or less complete.

Amaurobius pilosus, nov. sp. (Pl. XIII., Fig. 1).

Cephalothorax, black-brown, with grey hairs. Mandibles, black-brown in front, with brown hair, underneath paler yellow-brown and smooth. Fangs, the basal half bright yellow-brown, remainder paler. Lip and maxillae, yellowish grey, paler at edges, with brown upstanding hair. Sternum, black-brown, yellowish grey hair. Legs and palpi, darkish brown on femoral joint, paling to yellowish brown on others, white to greyish yellow hair. Patella, tibia and metatarsus ringed with dark grey. Abdomen, black-brown, with long grey hair above, no pattern, underneath a median field of dark brown hair edged with white and two parallel longitudinal lines of white hair reaching the whole length near median line, spinnerets and cribellum yellowish grey.

The *Cephalothorax* is broad and convex on cephalic part; equally high, rather long, and rounded at sides on thoracic part; shorter than patella cum tibia IV.; rather steeply sloping at sides and rear; a shallow median furrow at top of rear slope.

The front row of *Eyes* is straight, middle eyes round, side eyes oval, their long diameter the same as the middle and that distance away from them; the same also is the breadth of the clypeus. The rear row is procurved, all round, diameter equals two-thirds of front middle, two and a half diameters apart. Side eyes on a protuberance with front side, their diameter apart.

The *Mandibles* are knee-formed at base, conical, longer than patella I., thicker than femur I., and thickly covered with hair. The fangs are short, thick at base, and well curved. On the inner edge of false sheath, which is very sloping, are two small teeth, on outer edge four, of which the third is the largest.

The *Maxillae* are straight at sides, upright, and slightly rounded on front edge. The *Lip* is more than half the length of these, rounded at sides, straight in front and very slightly notched. There are fine upstanding hairs on both.

The *Sternum* is pear shaped, raised at edges, but flat on top. It ends in a long fine point, which reaches between the separated rear coxae. It is thickly covered with long hair, curling towards the centre, and this is intermixed with short, flat, white hairs.

The *Abdomen* is oval, straight in front, and rounded at rear, thickly covered with close hair; spinnerets two jointed, conical. The superior pair is longest, but much narrower than inferior. The intermediate quite small.

The *Cribellum* is smooth on the front face and not divided in the male.

The femoral joint of the *Palpi* is well curved. The tarsal joint is not much differentiated, but is furnished with a fine hooked stigma. Two points project from side of tibial joint, the upper one the largest.

The *Legs* are rather long and fine. The rear coxae are separated by a distance equal to half their breadth. They are covered with furry hair intermingled with flat white hairs the same as on the sternum. All the legs are furnished with short, fine spines.

Ceph.	-	$3\frac{1}{2}$ mm. long.	-	3 mm. broad.
Abd.	-	4 ,, ,,	-	3 ,, ,,

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1	1 mm.	4 mm.	5 mm.	5 mm.	= 15 mm.
2	$\frac{3}{4}$,,	$3\frac{3}{4}$,,	4 ,,	4 ,,	= $12\frac{1}{2}$,,
3	$\frac{3}{4}$,,	3 ,,	$3\frac{1}{2}$,,	$3\frac{1}{2}$,,	= $10\frac{3}{4}$,,
4	$\frac{3}{4}$,,	$3\frac{3}{4}$,,	4 ,,	4 ,,	= $12\frac{1}{2}$,,

or, 1, 2, 4, 3.

One male only, from Macedon.

In his synopsis of genera, M. Simon (Nat. Hist. des Ar., vol. I., p. 236) makes Amaurobius come into a division in which the rear coxae are contiguous. This, however, is no part of C. Koch's definition of the genus. The cribellum also should be double. In several species the cribellum is double in the females and single in the males. This species, therefore, remains in the genus Amaurobius, with which its eyes and clypeus agree, and not my genus Hylobius.

Family DICTYNIDAE.

See M. E. Simon's Hist. Nat. des Araignées, vol. I., p. 236.

SYNOPSIS OF GENERA.

5.—Lip evidently longer than broad - -	
5A.—Front middle eyes farther from the side eyes than from one another. *Clypeus about as broad as front middle eyes* - - - - - - -	Amaurobius
5B.—Front middle eyes farther from one another than from the side eyes. Clypeus much wider than front middle eyes - - - - - -	Hylobius.
—— Lip not longer than broad, front row of eyes equidistant - - - -	Badumna.

HYLOBIUS, nov. gen.

Differs from Amaurobius in having the front middle eyes nearer to the side eyes than to one another, the clypeus much broader than the front middle eyes, and the area of the four middle eyes broadest in front.

Type Hylobius divergens, n. sp.

In my specimens of Amaurobius segestrinus, L. Koch, the cribellum is double in the females and single in the males. The same is the case in Hylobius punctatus, nov. sp. These are the only species of the family in which I have both males and females·

HYLOBIUS.

Sternum produced between rear coxae - - -	*divergens.*
Rear coxae contiguous - - - - - - -	*punctatus.*

Hylobius divergens, nov. sp. (Pl. XIII., Fig. 2).

Cephalothorax, yellowish brown, inclining to black-brown on fore part. Mandibles, black-brown with lighter brown hairs, points of fangs reddish. Maxillae, lip and sternum brown with paler median streak on latter, hair dark brown. Abdomen, dark grey with two longitudinal, narrow, paler stripes on under side, hairs dark yellowish grey. Spinnerets and cribellum yellowish grey. Epigyne, brown. Legs and Palpi, yellow-brown with greyish hairs and brown spines.

Cephalothorax slightly longer than patella cum tibia of 4th pair of legs 2 mm. longer than broad, cephalic part straight at

sides, raised up, convex, and rather narrower than the rounded sides of the breast part. Small longitudinal fovea at commencement of rear slope.

The front row of *Eyes* is recurved, the two middle being round, one and a half diameters apart, and side eyes one diameter distant, oval, rear row procurved, middle eyes smaller than front middle, one and a half diameters apart, two and a half diameters from the side, which are half the long diameter of front side; and the same distance away on a common protuberance.

The *Mandibles*, stout and broad, are longer than the front patella and thicker than the front femur, knee-formed, with rather thick, down-lying hair. Fangs, strong and curved, with two teeth on inner falx edge, the lower the larger, a thick fringe and three teeth on the outer edge.

Maxillae arched, rather inclined over lip, wider in front than at base, rounded on outer edge. *Lip* more than half the length of the maxillae, straight in front without indentation, but springing from narrower neck at base.

The *Sternum* is a broad heart-shape, pointed at rear, and descending one-third of distance between rear coxae, which are separated by a distance equal to half their breadth.

The *Abdomen* is ovate, narrowest in front, rounded at sides, and widest about one-third of the length from the rear end. It is thickly covered with fine, down-lying hairs.

The cribellum in the female is faintly divided by a very thin line.

The *Palpi* are curved at the femoral joint, but short, straight and cylindrical in the other joints.

The *Legs* are stout, but tapering to the tarsal joints, which are fairly fine. The femur arched on upper side; short spines on all legs.

Ceph. -	- $6\frac{1}{2}$ mm. long,	- $4\frac{1}{2}$ mm. broad.		
Abd. -	- $8\frac{1}{2}$ „ „	- $5\frac{1}{2}$ „ „		

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1 -	$2\frac{1}{4}$ mm.	- 6 mm.	- 6 mm.	- $6\frac{1}{4}$ mm.	= $20\frac{1}{2}$ mm.
2 -	2 „	- 5 „	- $5\frac{1}{4}$ „	- $5\frac{1}{4}$ „	= $17\frac{1}{2}$ „
3 -	$1\frac{3}{4}$ „	- 5 „	- $4\frac{3}{4}$ „	- $4\frac{3}{4}$ „	= $16\frac{1}{4}$ „
4 -	2 „	- $5\frac{1}{2}$ „	- 6 „	- $5\frac{3}{4}$ „	= $19\frac{1}{4}$ „

or, 1, 4, 2, 3.

Hylobius punctatus, nov. sp. (Pl. XIII,, Fig. 3).

The Cephalothorax is a dark reddish brown, lighter towards the side slopes of the cephalic part, but darker along four radiating sulci on each side of the thoracic part. Mandibles, dark red-brown, thickly covered with dark grey hair. Lip, maxillae, sternum and coxae, dark yellowish brown, with fine brown hairs. Legs, yellow-brown with similar hairs and dark brown spines. The abdomen is dark grey, mottled with irregular lighter spots of short fine hair, upper and under sides alike.

The *Cephalothorax* is longer than patella cum tibia IV., two mm. longer than broad; cephalic part arched and prominent; thoracic part rounded at sides with three deep lateral indentations and a deep longitudinal fovea reaching to rear slope, which is rather steep.

The front row of *Eyes* is straight, the middle eyes round, a diameter apart, the side eyes oval, their long diameter being greater than that of the middle, and about half its length away. The rear row is slightly procurved; middle rather smaller than front middle one and a half diameters apart and two diameters from the side ones, which are oval, smaller than the front side, and their length away from the latter.

The *Mandibles* are knee-formed at base, conical, with short, well-curved fangs; two teeth on the inner false edge, the lower being larger of the two; a thick, brown fringe on outer side.

Maxillae arched, smooth, upright and rounded on outer edge.

Lip more than half the length of the latter, longer than broad, rounded at the sides, and straight in front. It springs from a neck at the base.

The *Sternum* is a broad, oval, but rather pointed at posterior end, furnished with short, fine, upstanding hair. It is not produced between the rear coxae, which are contiguous.

The *Abdomen* is oval, rather straighter in front, and clothed with thin, upright hair.

The *Cribellum* in the female is very white and distinctly divided across the middle. The epigyne has two oval hollows above a transverse fold.

The femoral joint of the *Palpi* are curved inwards, and the digital joint of the female's is dilated and pointed at the end.

The *Legs* are stout and smooth, with spines on all joints. The femur of the front pair is curved inwards.

The male, which in other respects closely resembles the female, has the cribellum undivided.

Ceph.	- -	6 mm. long.	-	4 mm. broad.
Abd.	- -	$6\frac{1}{2}$ „ „	-	$4\frac{1}{2}$ „ „

	Coxa.		Tr. & Fem.		Pat. & Tib.		Met. & Tars.		
Legs 1 -	2 mm.	-	$4\frac{3}{4}$ mm.	-	$5\frac{3}{4}$ mm.	-	5 mm.	=	$17\frac{1}{3}$ mm.
2 -	$1\frac{3}{4}$ „	-	4 „	-	$4\frac{1}{2}$ „	-	$4\frac{1}{4}$ „	=	$14\frac{1}{2}$ „
3 -	$1\frac{3}{4}$ „	-	4 „	-	4 „	-	4 „	=	$13\frac{1}{4}$ „
4 -	$1\frac{3}{4}$ „	-	$4\frac{1}{3}$ „	-	5 „	-	$4\frac{1}{2}$ „	=	$15\frac{3}{4}$ „

or, 1, 4, 2, 3.

See M. Simon's Hist. Nat. des Araignées, vol. I., p. 293.

Family OONOPIDAE. Group OONOPIDAE MOLLES.

Synopsis of Genera.

1.—Eye space transverse. Lip much longer than broad - - - - - - -	2.
2.—Legs smooth and rather long. Femoral joint of rear pair of legs much stouter than in other pairs - - - - - -	2A.
—— Legs bespined; all femoral joints about alike - - - - - - -	2B.
2A.—Middle eyes forming a straight or slightly procurved line with the front side eyes - - - - - - -	Orchestina.
2B.—Middle eyes about the same as in Orchestina - - - - - - -	Gippsicola.
—— Middle eyes occupying the middle space - - - - - - - - - -	Salsula.
—— Middle eyes forming a straight or slightly procurved line with the rear side eyes - - - - - - - -	Macedonia.

GIPPSICOLA, nov. gen.

The Cephalothorax rather long, convex, broad and obtuse in front. Eye space transverse, narrower by one-half than the

frontal breadth. Four front eyes nearly in a straight line, the middle largest, close to one another, but slightly separated from the side eyes. The two rear eyes set obliquely, their diameter distant from the front side eyes, and farther still from the middle eyes. Clypeus narrow, not exceeding in depth the diameter of the side eyes. Lip longer than broad, with straight sides. Maxillae long and upright. Sternum convex, shield shaped, longer than wide, tapering at the rear end. The coxae of the fourth pair of legs are rather widely separated from those of the third pair, and equally so from one another.

Legs bespined, not differing much in length in proportion 1, 2, 4, 3, or 1, 4, 2, 3; femoral joint of rear pair dilated.

Type G. raleighi, nov. sp.

MACEDONIA, nov. gen.

Macedonia differs from Gippsicola in having the middle pair of eyes in a straight or slightly procurved line with the rear side eyes. The side eyes nearly touching. The clypeus wider than the diameter of the largest eyes. Lip rounded at the sides and the maxillae slightly inclined over the lip.

Type M. burchelli, nov. sp.

These two species are peculiarly alike in general shape and coloration, and, judging from his description (Trans. N.Z. Inst., vol. 23, p. 128) also resemble in general appearance Mr. Urquhart's Oonops septemcincta, which I have not seen. In falx teeth, eyes, and tarsal claws they differ at least as much as do Salsula and Orchestina, but again in shape of lip, maxillae, sternum, cephalothorax, abdomen, spinnerets, etc., so far coincide as to suggest that they and possibly the N.Z. species should be included in one genus. The latter with its contiguous side eyes, separated middle eyes, and broad clypeus, hardly agrees closely with Oonops, Templ. The difference in the mode of insertion of the tarsal claws would be, however, rather remarkable for a single genus.

Macedonia burchelli, nov. sp. (Pl. XIII., Fig. 4).

Cephalothorax, dark yellow-brown. Mandibles somewhat darker still. Sternum, lip and maxillae, paler, orange. Legs and palpi, a golden yellow. Abdomen, above black, with 8 pale

yellow transverse stripes, all divided across the middle by a longitudinal, black stripe. They are largest in front, gradually diminishing and nearing one another as they reach the rear point; the underside is all yellow.

The *Cephalothorax* is considerably longer than the Patella cum tibia of any pair of legs. It is convex, slightly rounded, at sides and rear narrowest, but still broad, in front where it is straight truncate.

The *Eyes*, six in number, occupy a transverse area not much more than one-third of the frontal breadth. The middle pair are largest, of a broad, oval shape, inclined, and touching one another near their upper end. Their lower edges are in a line with those of the smaller rear side eyes, from which they are distant by their long diameter's length. The front and rear side eyes are alike in size and, touching one another, are placed obliquely on a shiny, black prominence, the front pair being nearer together than the rear pair.

The *Clypeus* is fairly broad, exceeding the long diameter of the middle eyes.

The *Mandibles* are conical, rather long, much exceeding in length the front patellae. On each margin of the falx sheath is one small tooth situated near the insertion of the fang.

The *Lip* is nearly twice as long as broad. It is rounded at the base, and at the lower half of the sides, whence it rather curves inwards to the anterior end, which is narrow, truncate, and notched in the middle. The middle area is convex, with a flat margin.

The *Maxillae*, which begin below the lip, are rounded at the base, broadest a little above, curve deeply inwards above the point of insertion of the palpi, whence they curve outwards again and end in a somewhat narrow point. They are slightly inclined over the lip.

The *Sternum* is a long, shield shape, nearly twice as long as the broadest part, one-third from the anterior end, narrowed and truncate in front, rather rounded at rear. It rises convexly from a flat margin; is smooth, with a few, upstanding hairs.

The *Legs* are only moderately stout. The femoral joints of all legs being slightly dilated in the middle and markedly curved, the first, second and third pairs towards the body forward, the

fourth pair towards the body backwards. Tarsal joints very short. The fourth pair of coxae are separated from the third pair by a space one-third their width and by half their width from one another. There are spines on all tibial and metatarsal joints, with two small ones on front inner edge of femur I. The claws spring from a hollow cup at end of tarsal joint.

The *Abdomen* is long, ovate, truncate, and widest at front end, rather pointed at rear. It is thinly clothed with upstanding hairs.

Two pairs of stigmata are distinctly visible, the front pair in line with the genital aperture and the posterior pair rather closer together just behind them.

The inferior spinnerets are conical, with a short conical second joint.

The superior pair are widely separated, much smaller in diameter, cylindrical, with small hemisperical second joint.

Ceph. -	- $4\frac{1}{4}$ mm. long.	- $2\frac{3}{4}$ mm. broad.
Abd. -	- 5 „ „	- 3 „ „

		Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs	1	- $1\frac{1}{8}$ mm.	- $3\frac{1}{2}$ mm.	- $3\frac{1}{2}$ mm.	- $3\frac{1}{2}$ mm.	= 12 mm.
	2	- $1\frac{1}{4}$ „	- 3 „	- 3 „	- $3\frac{1}{4}$ „	= $10\frac{1}{2}$ „
	3	- 1 „	- $2\frac{1}{2}$ „	- $2\frac{1}{2}$ „	- $2\frac{3}{4}$ „	= $8\frac{3}{4}$ „
	4	- $1\frac{1}{4}$ „	- $3\frac{1}{8}$ „	- 3 „	- 3 „	= $10\frac{3}{4}$ „

or, 1, $\overline{4, 2}$, 3.

Gippsicola raleighi. (Pl. XIII., Fig. 5).

Cephalothorax, a dusky yellow, with fine, pale yellow hairs. Mandibles, lip, maxillae and sternum, brighter yellow, hairs inclining to brown. Legs and palpi, same as cephalothorax, the hair on femora being dark brown. Abdomen, above black, with transverse yellowish stripes springing from a longitudinal median stripe of the same colour. It is covered with long, upstanding black and yellow hair. Below, yellow mottled with black. Spinnerets, yellow.

The *Cephlothorax* is long, obtuse in front, slightly rounded at the sides, and indented at rear.

The two middle *Eyes* are large and oval. They stand upright close together on their ends, their bottom edges in a line with the

front side pair. The latter are round, their diameter smaller than the short diameter of the middle eyes, half their diameter away. The rear side eyes are round, similar in size, a diameter distant from the front side; being placed obliquely, they are one and a half diameters from the middle eyes, and with the front stand on a black, shiny protuberance.

The *Mandibles* are long and straight, slightly knee-formed at the base, and more than twice the length of the front patellar joints. There are a few upstanding fine bristly hairs on the inner front edges; fangs a reddish yellow. On the inner margin of falx sheath are two large teeth, on the outer edge three teeth, of which the middle one is largest.

The *Lip* is nearly twice as long as broad, straight at the sides, truncate at the front edge, with a notch in middle, and a hollowed bordering down each side. It is two-thirds the length of the *Maxillae*, which are upright, parallel, cut off rather slopingly on inner side, rounded exteriorly, and narrowing towards the base.

The *Sternum* is a long shield shape, convex in centre, truncate in front, rather pointed at rear, but not reaching between the rear coxae; a moderate covering of fine, upstanding hair.

The *Palpi* have the femoral joint curved inwards, and rather broadened anteriorly. Tarsal joint long, tapering from a broad base.

The *Legs* are moderately long and fine, the femoral joint curved and thickened in the middle, on all pairs, numerous brown spines on underside of tibia and metatarsus of all legs. The tarsal joints are very fine, less than half the length of the metatarsal; about five pectinations on upper tarsal claws, which spring from a projection at the end of the tarsus, like a small onychium; no claw tufts. The fourth pair of coxae are as far apart from one another as from the third pair, about one-third their breadth.

Abdomen.—Long, ovate, truncate anteriorly and smallest at rear. The second pair of tracheal openings are plainly visible a little below the genital aperture near the median line.

Spinnerets, six. The inferior pair are conical and are raised from a common membranous base. The superior pair are cylindrical, smaller, and stand wider apart.

The *Clypeus* is narrow, barely the diameter of one of the side eyes.

Ceph.	-	3 mm. long.	- $1\frac{3}{4}$ mm. broad.
Abd.	-	4 ,, ,,	- 2 ,, ,,

		Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs	1	1 mm.	$2\frac{1}{2}$ mm.	3 mm.	$2\frac{1}{2}$ mm.	= 9 mm.
	2	1 ,,	$2\frac{1}{2}$,,	$2\frac{3}{4}$,,	$2\frac{1}{4}$,,	= $8\frac{1}{2}$,,
	3	1 ,,	2 ,,	$2\frac{1}{2}$,,	2 ,,	= $7\frac{1}{2}$,,
	4	1 ,,	$2\frac{1}{4}$,,	$2\frac{3}{4}$,,	$2\frac{1}{4}$,,	= $8\frac{1}{4}$,,

or, 1, $\overline{2, 4}$, 3.

I have named this after Mr. H. J. Raleigh, who kindly forwarded it to me from Gembrook, Gippsland (Eastern Dividing Range of Victoria).

Drassus debilis, nov. sp. (Plate XIV., Fig. 1).

Cephalothorax greyish yellow, with rather greyer hairs. Mandibles yellow, with bright reddish brown fangs. Lip maxillae and sternum yellow, with pale yellow hairs. Legs and palpi bright yellow, with pale yellow hair. Abdomen silver-grey above and greyish yellow, with silver-grey hairs, on under side.

The *Cephalothorax* is oval, slightly narrowed in front, shorter than patella cum tibia IV., and $\frac{1}{2}$ mm. longer than broad, rather low, and of even height the whole length. Lightly clothed with short, close-lying feathered hairs and a few upstanding bristles. A median sulcus indistinct and shallow.

The rear row of *Eyes* is procurved. They are equal in size, round, the middle pair a diameter apart and $1\frac{1}{2}$ diameters from the side. The front row is shorter and straight, the middle pair $1\frac{1}{2}$ diameters of rear, and same length away from them, half their diameter apart, a similar distance from the side eyes, which are oval—these are about half their diameter from, and the same size as, the rear side. The front middle only are diurnal, the remainder nocturnal. The *Clypeus* is the breadth of the front middle eyes.

The *Mandibles* are strongly knee-formed at base, conical, as long as the front patellae and hardly as thick as the front femora, slightly divergent, smooth and shiny. On the inner edge of falx sheath are two rather long teeth, and one long between two very short on the outer edge.

The *Maxillae* are upright, sloping on the inner margin and transversely arched on the upper and lower parts with a well-marked depression between. The *Lip* is half the length of the maxillae, as long as broad, truncate in front, the widest part springing from a neck and thence gradually narrowing anteriorly.

The *Sternum* is cordate, straight in front, slightly arched, and sparsely covered with fine upstanding hairs. On the outer margin are slightly marked depressions between the coxae.

The *Abdomen* is broadest near the front end, which is very straight, sides slightly rounded, and narrowing to a point at the rear. It is clothed with fine, close, lying hair of medium length. The spinnerets are of medium length, cylindrical, truncate, with very short hemispherical second joint. The inferior pair are larger in diameter and nearer together than the superior, which are rather the longer. The intermediate pair are close together, fine and short.

The *Legs* are rather thickly covered with fine, upstanding hair, not very stout, spines on the femur tibia and metatarsus of all legs. The two tarsal claws are very fine. On the metatarsus and tarsus of all pairs is a scopula and claw tufts on third and fourth. On femur of third and fourth pairs, above, the spines are 1.1. Tibiae III. and IV. have no spine above.

One female only, from Macedon.

Ceph.	- -	$2\frac{1}{4}$ mm. long.	-	$1\frac{3}{4}$ mm. broad.
Abd.	- -	$2\frac{1}{2}$ „ „	-	$1\frac{3}{4}$ „ „

		Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs	1	$\frac{3}{4}$ mm.	2 mm.	2 mm.	$2\frac{1}{4}$ mm.	= 7 mm.
	2	$\frac{3}{4}$ „	2 „	$1\frac{1}{2}$ „	$1\frac{3}{4}$ „	= 6 „
	3	$\frac{3}{4}$ „	2 „	$1\frac{1}{2}$ „	$1\frac{3}{4}$ „	= 6 „
	4	1 „	$2\frac{1}{2}$ „	$2\frac{1}{2}$ „	3 „	= 9 „

or, 4, 1, $\overline{2, 3}$.

By M. Simon's synopsis of sub families (*loc. cit.*, p. 341) to come into Drassodinae, to which it certainly should belong, the inferior mamillae ought to be widely separated and longer than the superior. In this specimen they are well separated, but shorter than the superior and nearer together. The eyes are like Leptodrassus, but the posterior row is distinctly longer than the anterior, and the laminae are strongly impressed. The eye area

does not, however, occupy the whole frontal breadth, nor are the rear eyes equidistant, nor the clypeus broader than the front eyes. I have, therefore, provisionally left it in the old genus of Drassus, Walck. It is really a Drassus, with the claws of a Hoemicloea, and, with more material to work from, might be constituted into a new genus, as it differs materially from both Drassodes, Westr., and Leptodrassus, Simon.

One male and one female (of the sub-family Drassodinae) have the chitinous careniform lamination on the edges of the falx sheath, which M. Simon denotes as the special characteristic of the group Gnaphoseae. The strongly impressed maxillae are sufficient to keep it in the family of Drassidae, otherwise in many respects it so closely resembles the Clubionidae as to be almost a connecting link between the two families. The inferior spinnerets are rather near together and in the shape of the cephalothorax and sternum and long front coxae it has analogies with Lampona, Thorell. The genus differs from Gnaphosa, Latr., in not having the rear row of eyess trongly recurved and in having the eyes constituting same equidistant.

It differs from Callilepis, Westr., in having the cephalothorax less attenuated in front, both rows of eyes straight, and the rear row longer than the front row (as in Gnaphosa), in the very narrow clypeus, and in having no long retractile fusules on the inferior mammillae, though it has somewhat similar short fusules in a central bunch.

GNAPHOSOIDES, nov. gen.

Cephalothorax oval, convex, the fore part broad and obtuse, a chitinous careniform lamination on the edges of the falx sheath, a short thoracic sulcus. The eyes of the front row near together, about equal in size, and in a straight line. The rear eyes in a straight or slightly recurved line, longer than the front row, equi-distant, or the middle eyes farther from the side than from one another. The clypeus distinctly narrower than the eyes of the front row. Legs (IV., I., II., III.) stout, but metatarsal and tarsal joints fine, with fine spines.

The inferior mamillae long, near together, with a nearly round truncature. The superior about equal in length but smaller in diameter, and two-jointed.

Type G. signatus.

Gnaphosoides signatus, nov. sp. (Pl. XIV., Fig. 2).

The Cephalothorax is reddish brown, the mandibles, lip and maxillae rather darker and redder, with dark brown hair. The sternum, palpi, and legs brighter yellowish brown, but the tarsi, metatarsi, and tibiae of the two front pairs distinctly redder, with pale yellowish grey hair.

The abdomen above is black, with two longitudinal rows of a pale brown scalloped pattern. In the female, the anterior end is almost yellow. The underside is grey, with spinnerets a bright brown.

The *Cephalothorax* is convex, rather long oval, truncate in front, where it is two-thirds the greatest breadth. From the median line it slopes gradually to the margin at sides and rear. The cephalic and thoracic parts are not separated by depressions. The median sulcus is short and shallow between the second and third pairs of legs, the hair is fine down-lying and directed inwards from the sides. Both rows of eyes are straight, the posterior longer than the anterior. In the front row they are close together, the two middle being round and the side oval, their longer diameter the same as the middle. The rear eyes are half the diameter of the front middle (the middle pair rather square, the side round), two of their own diameters apart. The two rows are *the same distance* apart, and the clypeus not more than one-fourth the diameter of the front middle eyes in depth.

The *Mandibles* are knee-formed at base, longer than the front patella, and not so thick as front femur. They project forward somewhat, and are thickly clothed with short down-lying hair and longer upstanding bristles. On the inner edge of the falx sheath is one rather stout tooth not, however, connected with the chitinous margin of the falx, which has a wavy edge, but with no regular teeth.

The *Lip* is rather large, longer than broad, and two-thirds the length of the maxillae, from the base it tapers slightly with straight sides towards the front, where it is truncate, the side edges are depressed, but the middle rather convex. It springs from a prominent fore part of the sternum, the base beginning before the maxillae.

The *Maxillae* are upright, convex, almost square in front, with a deep impression running transversely across the middle.

The *Sternum* is truncate at the anterior margin, thence running rather straight at the sides before widening out into a somewhat long oval.

The *Legs* are stout, the two front coxae longer than the rest. The front femurs are curved on the outer edge. The tarsi and metatarsi distinctly finer in proportion than the other joints.

The *Abdomen* is a long oval, cut straight in front and rounded at rear. The superior and inferior spinnerets are about equal in length and cylindrical, but the former are finer, with a short, conical second joint. The inferior pair stand each on separate bases, which almost touch one another. They are stout, with a sloping, truncated end, and a short bunch of spinning tubes springing therefrom. The front is also furnished with spinning tubes running up the whole joint.

Female -	Ceph. -	4 mm. long. -	3 mm. broad.
	Abd. -	5 „ „ -	3 „ „

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1 -	2 mm. -	3 mm. -	3½ mm. -	3 mm.	= 11½ mm.
2 -	1½ „ -	3 „ -	3¼ „ -	2¾ „	= 10½ „
3 -	1¼ „ -	2¾ „ -	2¾ „ -	2¾ „	= 9½ „
4 -	1½ „ -	3½ „ -	3¾ „ -	4 „	= 12¾ „

or, 4, 1, 2, 3.

Male -	Ceph. -	4½ mm. long. -	3½ mm. broad.
	Abd -	6 „ „ -	3½ „ „

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1 -	2 mm. -	3½ mm. -	5 mm. -	3½ mm.	= 14 mm.
2 -	1½ „ -	3 „ -	4 „ -	3 „	= 11½ „
3 -	1¼ „ -	2¾ „ -	2¾ „ -	2¾ „	= 9½ „
4 -	1½ „ -	4 „	4½ „ -	4½ „	= 14½ „

Compare E. Simon, *loc. cit.*, vol. I., p. 428.

Family ZODARIIDAE. Group STORENEAE.

Genera.

1.—Spinnerets, two only, etc. - - - - - Lutica.

—— Spinnerets, six; clypeus smooth - - 2.

2.—Clypeus narrower than eye space - -		3.
—— Clypeus wider than eye space - -		4.
3.—Area of middle eyes almost square. Mandibular fang (in the male) curved outwards - - - - - -		Laches.
—— Area of middle eyes longer than broad. Mandibular fang in both sexes similar and normal - - - - - -		Storenosoma.
4.—Clypeus at least not narrower than eye space. Area of middle eyes longer than broad. Mandibular fang in both sexes similar and normal - -		Storena.

STORENOSOMA, nov. gen.

The genus differs from *Laches*, Thor., in having the area of the median eyes trapeziform and having the falx fang normal and similar in both sexes. It differs from *Storena* in depth of clypeus in lip, which is broader than long, truncate, slightly hollowed in front, and maxillae perpendicular, not sloping over lip, which is only half the length of the maxillae.

Type S. lycosoides.

Storenosoma lycosoides, nov. sp. (Pl. XIV., Fig. 3).

Cephalothorax, mandibles, palpi, sternum, lip and maxillae bright brownish yellow, a brighter stripe passes down the median line and a dark band round the margin of the thoracic part. It is sparsely clothed with short whitey brown down-lying hairs. The abdomen is a dirty dark grey-brown, with lighter spots on back, the underside is paler, without pattern. Spinnerets pale brown.

The *Cephalothorax* is as long as the patella cum tibia of fourth pair of legs. Rounded at sides of thoracic part and only slightly narrower in front. The middle of the breast part is the highest point of the median line, which curves thence forwards and backwards. A short median sulcus reaches between second and third pairs of legs. The clypeus is only the breadth of the largest pair of eyes, but is increased by a grey membranous

bandeau of about the same again—the two together being about half the total length of the eye-space.

The *Eyes* are in three rows, 2, 4, 2, the middle row being straight along their lower edges, or in two rows very much procurved. The side eyes of the middle row are by far the largest, and lie two diameters apart, with two small eyes, one-third of their diameter and one of their own apart, between them. The front eyes have their diameter two-thirds of the large eyes, are twice that distance from one another, and half their diameter from large eyes of second row. The rear eyes, half diameter of large ones, are two and a half diameters from same and two diameters from one another.

The *Mandibles* are conical, remarkably knee-formed at base, slightly divergent, and longer than patella of front pair of legs. The fangs long and thin and only slightly curved. On inner edge of falx margin are two large teeth placed near the middle. On outer edge two small teeth lie near the lower extremity. It is bordered by a brownish yellow fringe.

The *Maxillae* are upright, curved on the top and along outer edge, narrowing to the base. The *Lip* is broader than long, truncate, and slightly hollowed in front, half the length of the maxillae. It springs from a neck, just above which is its broadest part, thence sloping anteriorly.

The *Sternum* is broadly cordate, terminating in an obtuse point at rear. It is covered with fine, upstanding, brown hairs, and is bordered by a smooth edging, which lies between it and the coxae. The two rear coxae are slightly separated, and from the petiole a wedge-shaped chitinous marking points upwards between them.

The *Palpi* are slight, the femoral joint being much curved inwards.

The *Legs* are stout at base, tapering to the tarsal joints, which are fine and less than half the length of the metatarsal. The tarsal and metatarsal joints armed with long, brown spines. Three claws spring from the hollowed end of the tarsal joint, with small claw tufts. Bristly hairs, hardly amounting to a scopula, line the under side.

The *Abdomen* is ovate, broadest one-third from anterior end. Spinnerets six, the inferior pair with moderately long second joint,

and, springing from a membranous base, are considerably larger than the small superior pair. The epigyne consists of two elliptical shells, placed horizontally, about their short diameter apart.

The eyes show most likeness to those of Storena annulipes and S. pictus, but the colouration of the body is very different from the Storena type. The general appearance is more that of the Lycosidae.

I have five specimens, from Macedon.

Ceph.	- -	4½ mm. long.	-	3 mm. broad.
Abd.	- -	6 „ „	-	4½ „ „

		Coxa.		Tr. & Fem.		Pat. & Tib.		Met. & Tars.		
Legs 1	-	1 mm.	-	3 mm.	-	3½ mm.	-	3 mm.	=	10½ mm.
2	-	1 „	-	3 „	-	3 „	-	3 „	=	10 „
3	-	1 „	-	3 „	-	2½ „	-	3 „	=	9½ „
4	-	1 „	-	4 „	-	3½ „	-	4½ „	=	13 „

or, 4, 1, 2, 3.

Compare L. Koch and v. Keyserling, Australian Arachnidae, vol. I., p. 301.

SYNOPSIS OF SPECIES OF HABRONESTES, L.K. (Storena, Walck).

I.—Femur of all legs white at the base - -

B.—Second row of eyes recurved - - -

b.—Cephalothorax not so broad as tibia cum cum patella IV. - - - - -

a.—Eyes of third row their diameter apart, and much wider apart than middle eyes of second row; abdomen underneath whole coloured -

1.—Rear eyes and side eyes of second row all larger than front row and middle eyes of second - - - S. picta.

2.—Middle eyes of second row much larger than any of the other eyes - - - - - - - S. macedonensis.

Storena macedonensis, nov. sp. (Pl. XIV., Fig. 4).

Cephalothorax, mandibles, sternum, part of lip and maxillae, dark brown, front of lip and inner margin of maxillae yellowish. Abdomen above black with white markings, underneath dark brown, sides white; the white markings on back consist of first two longitudinal lines each made up of an oval anteriorly, followed by two small rounds and then two larger round spots; behind these double lines is a single median line reaching to the rear of the abdomen, and made up of one small round spot followed by a triply scalloped long one.

Coxae and adjoining half of femur yellowish white, remainder of femur black. Patella, tibia, metatarsus, and tarsus, yellow. Thin black spines on the legs.

Cephalothorax 2-3rds mm. longer than greatest breadth, slightly shorter than patella cum tibia IV., rounded at sides and in front where it narrows to half the width. Cephalic part higher than thoracic, a longitudinal fovea behind the cephalic part short and deep. The skin is smooth and shiny, the *Eyes* prominent. The second row is recurved, the two centre being twice the long diameters of the side eyes, which are oval. They are all equidistant, the short diameters of the side eyes apart. The front pair are similar to the side eyes of the second row, their short diameter distant from these and the same from the centre eyes. The rear row are round half the diameter of the larger central of second row, from which they are distant two of their own diameters, and one of same apart.

The *Mandibles* are conical, straight, covered with thick furry hair, and as long as front patella.

The *Maxillae* are broadest at the base narrowing to the front, they overhang the *Lip* which is two-thirds their length.

The *Sternum* is a broad heart-shape, arched, without side impresssions, coriaceous, with short fine hair pointing to the rear.

The *Abdomen* is ovate truncate in front widening to rear, arched and high, as long but barely as wide as the cephalothorax.

The *Legs* are long, fine, and smooth, with thin spines.

Ceph. -	- 3 mm. long.	--	$2\frac{1}{3}$ mm. broad.	
Abd. -	- 3 " "	-	$2\frac{1}{4}$ " "	

		Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs	1 -	$1\frac{1}{4}$ mm. -	$3\frac{1}{4}$ mm. -	3 mm. -	$4\frac{1}{2}$ mm.	= 12 mm.
	2 -	$1\frac{1}{4}$ „ -	$3\frac{1}{4}$ „ -	3 „ -	4 „	= $11\frac{1}{2}$ „
	3 -	1 „ -	$2\frac{3}{4}$ „ -	$2\frac{3}{4}$ „ -	4 „	= $10\frac{1}{2}$ „
	4 -	$1\frac{1}{4}$ „ -	3 „ -	$3\frac{1}{4}$ „ -	5 „	= $12\frac{1}{2}$ „

or, 4, 1, 2, 3.

Araneus memorii, nov. sp. (Pl. XV., Fig. 1).

Cephalothorax, mandibles, maxillae, lip, sternum, palpi, and legs, pale ivory yellow, with light brown spines and pale yellowish white hairs. The abdomen on the upper side is pale yellowish green, with two conspicuous reddish brown spots on the shoulders in a line with the broadest part of the back, two small round dark spots behind these, three pairs of quite small dots behind these again. The hairing is faintly yellow. Underneath the abdomen is pale yellow brown, epigyne and spinnerets the same.

The *Cephalothorax* is as long as patella cum tiabia IV., very slightly longer than broad, narrowed in front, rounded at the sides, with faintly marked depressions between the cephalic and thoracic parts. There is no median sulcus, but a rather wide depression in the rear slope where it is overhung by the abdomen.

The four middle *Eyes* are sessile, about equal in size, and form a trapezium broadest in front, the rear pair being one diameter and the front pair one and a half diameters apart, the same between front and rear. Seen from above the front side eyes are in a line with the rear middle, and twice the breadth of the trapezium at rear away. Seen from in front they are on a line with the front middle. The front and rear side eyes are close together, the front being on a slight indication of a tubercle the rear sessile. All eyes are bright yellow.

The *Mandibles* are conical, as long as the front patellae, slightly knee-formed at base, with small weak fangs.

The *Lip* is triangular, broader than long, swelling out from a straight neck, and less than half the length of the *Maxillae*, which are upright straight in front, and as broad as long.

The *Sternum* is heart-shaped, pointed at rear, with deep impressions between the coxae, and raised ridges pointing to the latter. It is smooth and membranous, with a few upstanding hairs round the edge.

The *Abdomen* is broadest about one-fourth of its length from the front margin, which is rounded. It narrows to the rear, which is also rounded, the sides being nearly straight. The underside of the abdomen is folded in deep transverse wrinkles, smaller rows of which pass round from beyond the spinnerets to the sides.

The *Legs* have their coxae rather large, the rear pair being specially broad, and divided longitudinally with a suture. The femoral joints are arched above and flattened at the sides. The patellae are long and flat, the spines short and stout. The tarsi and metatarsi are much finer than the tibial joints, and clothed with long bristly upstanding hair.

Ceph.	- $2\frac{1}{4}$ mm. long.	-	2 mm. broad.
Abd.	- 5 „ „	-	$4\frac{1}{2}$ „ „

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1	- 1 mm.	- 2 mm.	- $2\frac{1}{4}$ mm.	- $3\frac{1}{4}$ mm.	= $8\frac{1}{2}$ mm.
2	- $\frac{3}{4}$ „	- 2 „	- $2\frac{1}{4}$ „	- $2\frac{1}{2}$ „	= $7\frac{1}{2}$ „
3	- $\frac{3}{4}$ „	- $1\frac{1}{2}$ „	- $1\frac{1}{2}$ „	- $1\frac{1}{2}$ „	= $5\frac{1}{4}$ „
4	- 1 „	- $2\frac{1}{4}$ „	- $2\frac{1}{4}$ „	- $2\frac{1}{4}$ „	= $7\frac{3}{4}$ „

or, 1, 4, 2, 3.

I have named this spider after Mr. John Memory of the Macedon Government Nursery, who has kindly collected for me many therefrom in addition to this.

Araneus scutigerens, nov. sp. (Pl. XV., Fig. 2).

Cephalothorax black-brown on thoracic, reddish brown on cephalic part, the latter covered with rather long, upstanding and short, down-lying, forward-directed, white hairs, a few dark bristles in middle of cephalic part on circular nodules. The mandibles black-brown, paler on the lower inner edge, with grey hairs. Sternum black-brown, with short grey and brown hairs. Lip and maxillae the same, with broad, pale edges. Legs and palpi dark reddish brown, with amber bands on all joints, the femur on underside only near the base, the hairing pale. Spines are white. The abdomen above has a dark brown, four-scalloped pattern, broadest in front and narrowing to rear, edged with grey; a striking, yellowish white, narrow, median stripe, edged with black, divides the back shield into two halves. Underneath

the body is black-brown, with a yellowish area in front of the epigyne; two longitudinal oval spots of yellow lie each side halfway between the epigyne and the spinnerets.

The *Cephalothorax* is shorter than patella cum tibia IV. and half mm. longer than broad. It is rounded at the sides and rather broad in front. The cephalic part is distinctly raised away from the thoracic and alone covered with hair. The four middle eyes and side pairs on moderately high prominences.

The four middle *Eyes* form a trapezium, broadest in front, the rear pair being one and a half diameters from each other and from the front pair, which are in diameter one and a half of the rear. They are their diameter apart. Seen from above both front and rear side eyes, which touch one another, are in a recurved line with the rear middle. The clypeus equals the diameter of the front middle eyes.

The *Mandibles* are conical, knee-formed, longer than patella I., and thicker than femur I.

The *Maxillae* are as long as broad, straight in front. *Lip* less than half their length, broader than long, running to a point in front.

The *Sternum* is heart-shaped, with three prominences down each side. It is thinly covered with hair at the sides, but bare along a median longitudinal stripe.

The *Abdomen*, rounded in front, where it is broadest, is not much longer than broad. It narrows to the rear end, where it is also rounded off.

The *Legs* are moderately fine, the shanks curved outwards on upper side. Bare longitudinal stripes on the tibiae are clearly defined. The spines are stout.

Ceph.	-	$8\frac{1}{2}$ mm. long.	-	$7\frac{1}{2}$ mm. broad.
Abd.	-	10 „ „	-	6 „ „

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1	$1\frac{1}{4}$ mm.	5 mm.	$5\frac{1}{4}$ mm.	$5\frac{1}{2}$ mm.	= 17 mm.
2	$1\frac{1}{4}$ „	$4\frac{3}{4}$ „	5 „	5 „	= 16 „
3	1 „	$3\frac{1}{2}$ „	3 „	$3\frac{1}{4}$ „	= $10\frac{3}{4}$ „
4	$1\frac{1}{4}$ „	4 „	$4\frac{1}{2}$ „	$3\frac{3}{4}$ „	= $13\frac{1}{2}$ „

or, 1, 2, 4, 3.

In the collection of the National Museum of Victoria are numerous specimens from various localities in S. Gippsland, whence it would appear that they are fairly abundant in the south-easterly coast district of Victoria. Some vary considerably from the normal type in colouration of the abdomen, the characteristic white stripe being replaced sometimes by a black one, and one specimen has a large oval brown field, without any stripe at all.

Cyrtarachne latifrons, nov. sp. With *var.* atuberculata.

(Pl. XV., Figs. 4 and 5).

Cephalothorax yellowish brown, mandibles the same, but darker towards the lower edge. Fangs dark brown, all lightly covered with pale yellowish hair. Sternum, lip and maxillae dark reddish brown. Femur of first three pairs of legs reddish, the other joints and palpi yellowish to dark brown. Femur of fourth pair dark brown. The abdomen on the upper side is reddish brown, pitted with darker brown depressions.

In the middle of the back is a large oval velvety black transverse field. The underside of the abdomen is dirty reddish brown, with a yellowish white patch between the epigyne and spinnerets. The hairs are a pale yellow.

The *Cephalothorax* is as long as patella cum tibia IV., as broad as long. The cephalic part is raised vertically in two protuberances, one at each side, with a depression between them. The cephalothorax is set nearly at right angles to the middle of the underside of the abdomen. The four middle *Eyes* are on a low prominence, the whole forming a trapezium broader than long, the rear eyes being rather larger and farther apart than the front. The side eyes, a long distance off, are close together, and form a procurved line with both front and rear middle. The *Clypeus* is as broad as the whole central eyes space is wide, and the upper forehead is blotched with tubercles.

The *Mandibles* are thicker at the base than the front femur, tapering to a small point at the lower end, with short, stout, well curved fangs. On the lower falx edge are three rather prominent teeth.

The *Maxillae* are as broad as long, arched, smooth, and rounded in front. The *Lip* is broader than long, slightly rounded in front and narrowed towards the base.

The *Sternum* is shield-shaped, smooth, and slightly raised. It has a deeply cut recurved front margin, and is thinly sprinkled with long upstanding bristles. There are no prominences opposite the coxae.

The *Abdomen* is 1 mm. longer than broad, rounded in front, square at sides, and slightly tapering to an obtuse point at the rear. In the space surrounding the spinnerets are deep transverse wrinkles.

Two large protrudent pinnacles spring almost perpendicularly from near the front margin, and here the abdomen is rather thinner than at the rear.

There are no *small teeth* on the abdomen, and the depressions are very indistinct, six in two rows on the back being most apparent.

On the underside the belly is protuberant between the spinnerets and the epigyne. It is smooth and shiny, and slightly mottled, outside this it is deeply wrinkled. The hairs are short and upright, of a pale colour. The epigyne is of the stylus type, the pendant being four times as long as it is broad at the base.

The *Legs* and *Palpi* are smooth and lightly haired. The two front femurs are thicker than the remainder. The patellar, tibial and metatarsal joints are notably flattened. The metatarsi and tarsi of the front pair of legs have thick rows of bristles on each side.

From the measurements below, this species will be seen to be larger than either C. bispinosa, Keys., or C. specisosa, L. Koch.

Another female, rather longer in the abdomen, without the pinnacles, and wanting the dark, transverse field on the upper side of the abdomen, otherwise resembles the above in every detail. I have made this a variety under the name of atuberculata. They were both found in the same neighbourhood, the Government Nursery, at Lower Macedon, by Mr. J. Memory.

The presence of this pair of large tubercles is one of the differences by which M. Simon distinguishes his genus Poecilopachys from Cyrtarachne, Thor., but these specimens are otherwise quite similar, and may have been from the same brood.

Measurements as follows:—

Ceph.	3½ mm. long.	3½ mm. broad.
Abd.	8 „ „	7 „ „

		Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs	1	1 mm.	4 mm.	4 mm.	3½ mm.	= 12½ mm.
	2	1 „	4 „	3¾ „	3¼ „	= 12 „
	3	1 „	3 „	2¾ „	2 „	= 8¾ „
	4	1¼ „	3¾ „	3½ „	3 „	= 11½ „

var. ATUBERCULATA.

Ceph.	3½ mm. long.	3½ mm. broad.
Abd.	9 „ „	8 „ „

Legs	12½ mm.	12 mm.	8¾ mm.	11½ mm.

Dolophones maximus, nov. sp. (Pl. XV., Fig. 5).

Cephalothorax and upper side of abdomen, legs and palpi yellowish brown, with nearly white, fine, down-lying hair. Lip and maxillae orange, with pale edges. Coxae and underside of femora reddish. Sternum the same. Underside of abdomen black and shiny, with two yellowish mottled areas on each side of the breathing slits. The colouring and hair clothing of the upper side turns over to the underside and forms a margin all round.

The *Cephalothorax* is broadest at the rear, narrowing gradually to the front. The head and breast parts are equally low and separated by side impressions; a longitudinal fovea on the latter.

The four median *Eyes* are situated on a prominence, the two front one and a half of their diameters apart, and a similar distance from the rear pair, which are twice the diameter of the front, and two of their diameters apart. The side eyes, half diameter of the front middle, are contiguous on a small tubercle. They are five diameters of the front middle away from and in a straight line with them.

The *Mandibles* are stout, shorter than front patella, and rather thickly covered, on the inner side especially, with coarse, bristly, pale yellow hair.

The *Maxillae* are upright, the upper half broad and square, the lower half narrowing somewhat abruptly. The *Lip* is half

the length of the maxillae, straight and broad in front, whence it widens to one-third of its length down, and from there gradually narrows again to the breadth of the front margin at the base.

The *Sternum* is a broad, shield-shape, straight in front, rounded at the sides and ending posteriorly in a double point. In front of each coxa is a rather prominent hump, and a median longitudinal ridge runs from the middle to the front edge. It is lightly clothed with fine, upstanding hairs.

The *Abdomen*, which overhangs the cephalothorax, and is twice as broad as long, is flat on the under side and slightly convex on the upper. The contour of the front edge is wavy, and the greatest transverse breadth just below the same, from which point, with wavy side lines, it curves to an obtuse point at rear.

The *Epigyne* has a short stylus, very wide at the base. It narrows rapidly to a fine point in broad transverse rugations.

The back ocellations are very faint, but are just indicated. The *Legs* are stout and long, with orange coloured stiff bristly hair standing out at the sides. Two dark longitudinal lines run down the upper side of each femur. The tibia and patella are somewhat flattened.

The *Palpi* are rather short, the tarsal joint being the longest; they are covered with stiff bristly hair.

Ceph. -	- 4 mm. long.	- $5\frac{1}{2}$ mm. broad.
Abd. -	- 8 „ „	- 16 „ „

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1 -	$1\frac{1}{2}$ mm.	- $5\frac{1}{2}$ mm.	- 5 mm.	- $4\frac{1}{2}$ mm.	= $16\frac{1}{2}$ mm.
2 -	$1\frac{1}{4}$ „	- 5 „	- 5 „	- $4\frac{1}{2}$ „	= 16 „
3 -	$1\frac{1}{2}$ „	- $4\frac{1}{2}$ „	- 4 „	- $3\frac{1}{2}$ „	= $13\frac{1}{2}$ „
4 -	2 „	- 7 „	- 5 „	- 6 „	= 20 „

or, 4, 1, 2, 3.

It will be seen that this species is of a large size, and of a type totally different from any southern forms of the genus heretofore collected. I thought it just possible that coming from the State Nursery it might have been introduced. However, on looking through the National Museum collection, I find a smaller specimen of the same from Marysville, North Gippsland, Victoria, and several others from localities not stated.

Argoctenus pectinatus, nov. sp. (Pl. XVI., Fig. 1).

The cephalothorax is yellow-brown, with short curly greyish yellow hairs, the eyes bright topaz. The mandibles, dark brownish grey, paler on the lower part of inner edge, with upstanding black bristles, fangs brownish pink. The lip and maxillae, ashy grey, with pale ivory yellow edgings. The sternum is dark grey, with thin greyish yellow hair. The abdomen is yellowish grey, with short stout black upstanding hairs, and down-lying pale yellow, curved as on cephalothorax. The sides and underpart are greyer than above. Spinnerets, dark grey. The upper joint of superior pair yellowish. The legs and palpi are coloured like the cephalothorax, the femoral joints of the two rear pairs of legs being somewhat darker and greyer, as is the underside of all the femora, and the coxae, agreeing with the colour of the sternum.

The *Cephalothorax* is shorter than the patella cum tibia of the 4th pair of legs, and $\frac{1}{4}$ mm. longer than the breadth between the 2nd and 3rd pairs.

The cephalic part is well raised up, and runs about straight to the middle of the cephalothorax, where begins a very deep, well marked fovea with rounded edges. The side-slopes are rather pronounced, and end in a clearly marked depression, the beginning of the somewhat broad flat margin of the thoracic part. Three or four long bristles stand out from the forehead just below the eyespace. The front of the face is perpendicular from the rear middle eyes, the rear side eyes standing on the side edges of the cephalic median ridge. The clypeus is the breadth of the front pair of eyes.

The *Eyes* of the front row are somewhat smaller than those of the third, both pairs being about two-thirds of their respective diameters apart.

The second row (or side eyes of first row) are very minute, and are equidistant from the front and rear eyes of the middle square, twice the same distance from the side rear, or fourth row, which are the largest of any of the eyes, $1\frac{1}{2}$ diameters of front pair.

The *Mandibles* are long, decidedly longer than the front patellae, rather strongly arched, smooth and shiny, a long sloping falx edge makes them diverge from about the middle. They are thinly clothed with short rough hairs and long upstanding bristles. The fangs are short, weak and well curved.

The *Maxillae* are upright, convex on both inner and outer sides. The upper margin rounded and entirely covered with hair fringe, on the inside slope the fringe grows from the upper, or inner, side. The *Lip* is broadest at the base, distinctly broader than long, arched in front with a broad sloping margin. It is less than half the length of the maxillae.

The *Sternum* is a broad heart-shape, terminating in a narrow point between the rear coxae. It is smooth and shiny, with a few scattered hairs round the edges.

The *Abdomen* is rather long ovate, straight in front, and curved at sides, broadest one-third of length from rear end, where it is rather pointed. The spinnerets are short, the front pair being thickest, and the second joint of the superior pair distinctly long and conical.

The *Legs* are smooth underneath, but thickly covered on the upper side with short down-lying hair. The spines are very long and strong. On the underside of the front tibiae are five pairs of spines (four long, and then one short). The spines on this and the metatarsal joint are unusually long and stout, and stand up in a remarkable manner in the way M. Eugene Simon describes (*Loc. cit.* vol. II., p. 125) as the special characteristic of his *Zoreae* as opposed to his *Miturgeae*, to which group Argoctenus is referred, but which should here have weak sessile spines. The tarsi and metatarsi of all the legs are fine and without scopula, but a claw tuft terminates all tarsi, the two claws being fine and weak, straight along the shaft, then curved at the end. None of the femoral joints have spines on the upper side.

I have a male of the species from Frankston, Port Phillip Bay. They live under fallen leaves.

Ceph.	- - 2 mm. long.	-	$1\frac{3}{4}$ mm. broad.
Abd.	- - 3 „ „	-	$1\frac{1}{2}$ „ „

		Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs	1	- 1 mm.	- $2\frac{1}{4}$ mm.	- $2\frac{1}{4}$ mm.	- 2 mm.	= $7\frac{1}{2}$ mm.
	2	- 1 „	- 2 „	- 2 „	- 2 „	= 7 „
	3	- 1 „	- 2 „	- 2 „	- $1\frac{1}{2}$ „	= $6\frac{1}{2}$ „
	4	- 1 „	- $2\frac{3}{4}$ „	- 3 „	- 3 „	= $9\frac{3}{4}$ „

or, 4, 1, 2, 3.

Syspira rubicunda, sp. nov. (Pl. XVI., Fig. 2).

The cephalothorax is ruddy brown, rather paler in the middle, with two black-brown, broadish stripes running from the eye-space to the rear slope, where it is again reddish brown to the margin. The paler parts are covered with orange hair, with five black-brown spots round the sides of the thoracic part, and two narrow, dark stripes on the sides of the cephalic. The mandibles are black-brown, with red fangs and thick brown hair on falx. Lip, maxillae, sternum, and coxae, black-brown, with dark brown and grey hair.

The abdomen above is dark brown, with orange hair irregularly mottled with large spots of black hair. The underside is black, with black hair and four longitudinal white stripes running from the epigyne to the spinnerets, which are dark yellowish brown.

The legs and palpi are brown on the femoral joint, the lower parts pale orange.

The *Cephalothorax* is convex, oval, narrowing in front to half the width between second and third pairs of legs. It is longer than patella cum tibia of fourth pair. A rather deep median sulcus reaches from the rear slope to the pars cephalica. A thick fillet of hair surrounds the edge of the thoracic part.

The front row of eyes is straight, the middle pair being twice the diameter of the side eyes, half their diameter apart, and one-third diameter from the side. The clypeus is half the diameter of the front middle eyes in width. The rear row of eyes is straight, or slightly recurved, broader than the front row. The eyes two-thirds the diameter of front middle pair. The two middle are their diameters apart, same distance from front middle, and one and a half diameters from the rear side.

The *Mandibles* are knee-formed at base, longer than front patellae, and as thick as front femur. They are thickly covered with down-lying brown hair on the upper two-thirds; a few up-standing black hairs near the point. The fangs are stout and long; two teeth on the inner falx edge.

The *Maxillae* are upright, arched with thick fringe on the inner margin, longest at the top end. The *Lip* is truncate anteriorly arched, and springs from a short neck. It is as broad as long, and less than half the length of the maxillae.

The *Sternum* is heart-shaped, rather straight in front, and pointed at the rear end; arched in centre, and thinly clothed with upstanding bristly hair.

The *Abdomen* is oval, rounded in front and at sides. It is thickly covered with short coarse hair, dark brown to black, except the white hair forming the stripes on the underside. The inferior pair of spinnerets are cylindrical truncate at top, contiguous at base. The superior pair have a short second joint distinctly conical. They are rather longer, but smaller in diameter than the inferior.

The *Palpi* are as long as the cephalothorax, thickly covered with hair. The femoral joint is short and incurved.

The *Legs* are stout and hairy; a scopula on all tarsi and metatarsi; stout spines on femora, tibiae and metatarsi.

Ceph. -	- 5 mm. broad.	- 4 mm. long.
Abd. -	- 7 ,, ,,	- $4\frac{1}{2}$,, ,,

	Coxa.	Tr. & Fem.	Tib. & Pat.	Met. & Tars.	
Legs 1	- $1\frac{3}{4}$ mm.	- 4 mm.	- 4 mm.	- $3\frac{1}{2}$ mm.	= $13\frac{1}{4}$ mm.
2	- $1\frac{3}{4}$,,	- $3\frac{1}{2}$,,	- $3\frac{1}{2}$,,	- $3\frac{1}{2}$,,	= $12\frac{1}{4}$,,
3	- $1\frac{1}{2}$,,	- $3\frac{1}{2}$,,	- $3\frac{1}{2}$,,	- $3\frac{1}{2}$,,	= 12 ,,
4	- $1\frac{3}{4}$,,	- $4\frac{1}{2}$,,	- $4\frac{1}{2}$,,	- $4\frac{1}{2}$,,	= $15\frac{1}{4}$,,

Miturga maculata, nov. sp. (Pl. XVI., Fig. 3).

Cephalothorax reddish brown, darker in front than in the middle; median furrow dark, with five dark stripes leading therefrom towards the margin on each side. The hairs are pale yellowish brown, darker brown on the dark patches; a thickly haired pale stripe round the margin of the thoracic part. It reaches farther up the sides on the cephalic part, also between the middle and side eyes. The mandibles are black-brown, with long, pale, bristly hair, on the upper part, thinner and darker on the lower. Fangs deep red, with pale red fringe on outer falx edge. Lip and maxillae dark reddish brown, with black bristles on the outer edges of the latter and pale reddish brown fringes on inner. Sternum pale brown, with down-lying yellow and upstanding dark brown hairs. Legs and palpi bright golden brown, with greyish yellow hair, tending to brown on the coxae. Abdomen above pale yellow-brown, mottled irregularly with

black, but leaving a pale yellow streak from anterior margin to about the middle, followed by two rows of paler spots to posterior end, underneath black, with four longitudinal lines of white hairs in patches, sides irregularly blotched with white on dark brown ground.

The *Cephalothorax* is longer than patella cum tibia IV., well rounded at sides, two mm. longer than broad, tapering to the front, where it is truncate. The rear part is slightly convex, with a well-marked, deep, median sulcus.

The front row of *Eyes* is straight. The two middle rather larger than the side and barely the diameter of the side eyes apart. The rear row is recurved, the rear middle eyes larger than the front and the rear side. The area of the four median is broadest at rear and as long as broad. The rear middle farther from the side than from one another. Side eyes, three of their diameters apart, set obliquely on a joint tubercle.

The *Clypeus* is rather wider than the front middle eyes.

The *Mandibles* are conical, knee-formed at base, slightly divergent, and as long as the front patellae. The basal half has long, bristly, down-pointing hair. On the inner margin of the falx sheath are two teeth wide apart, at intervals dividing the slope into three.

The *Lip* is as broad as long, straight in front, rounded at base, and less than half the length of the *Maxillae*, which are upright, rounded at front and sides, widest in middle, and with thick, bristly hair on ths outer margin.

The *Sternum* is broad oval, with depressions between the coxae; is thickly covered with down-lying hair and thin upstanding bristles.

The *Abdomen* is ovate, straight in front and pointed at rear, about one and a half times as long as broad; thickly covered with coarse down-lying hair. The second joint of the superior spinnerets is only half as long as the first. The epigyne of the female is nearly circular, with raised edging; a central depression, and, further, a pair of circular depressions in the central space.

The male *Palpi* has its organs well differentiated, and a long flagellum winding half-way round the lower side of the bulb. A square projection, with claw at one angle, stands out from the side of the tibial joint.

The *Legs* are fairly stout, with scopulae on all tarsi, and metatarsi, thin only on the latter, in the two rear pairs.

Female	-	Ceph.	- 7 mm. long.	-	5 mm. broad.
		Abd.	- 10 „ „	-	6½ „ „

		Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs	1	- 2 mm.	- 5 mm.	- 6 mm.	- 5 mm.	= 18 mm.
	2	- 2 „	- 5 „	- 5½ „	- 4½ „	= 17 „
	3	- 1¾ „	- 4½ „	- 5 „	- 4½ „	= 15¾ „
	4	- 2 „	- 5½ „	- 6 „	- 6½ „	= 20 „

Male	-	Ceph.	- 6 mm. long.	-	5 mm. broad.
		Abd.	- 7 „ „	-	4½ „ „

		Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars	
Legs	1	- 2 mm.	- 5 mm.	- 6½ mm.	- 5½ mm.	= 19 mm.
	2	- 2 „	- 5 „	- 6 „	- 5 „	= 18 „
	3	- 1¾ „	- 5 „	- 5½ „	- 5 „	= 17¼ „
	4	- 2 „	- 6 „	- 7 „	- 7 „	= 22 „

In Report of the Horn Expedition[1] I described a Liocranum, L. Koch, under the name of L. albopunctatum. M. E. Simon has a genus Medmassa (Hist. Nat. des Ar., Vol. II., p. 198) which takes in a portion of Liocranum, and will, I think, well include L. albopunctatum. The only point in the specification which would incline me to make a new genus for these, is that he makes his side eyes narrowly separated, while here they are rather widely separated (by at least two diameters of the rear eyes). With this exception it may justly be put into Medmassa with three other species, one probably L. Koch's L. pallipes, described by him from an undeveloped specimen and the others I describe below.

In his sub-family of Corinninae (fam. Clubionidae, *loc. cit.* p. 23), M. Simon distinguishes them as having "sternum distinctissime marginatum."

The group Corinneae, in which the genus Medmassa occurs (*loc. cit.* p. 128), has "chelarum margo inferior dentibus 3-4 armatus."

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[1] Report on the Work of the Horn Scientific Expedition to Central Australia, pt. ii., Zoology, p. 328.

The synopsis of genera gives to Medmassa "sternum tenuiter vel vix distincte marginatum," and the specification of the genus gives "margine inferiore sulci quadridentato rarissime bidentato vel quinquedentato. Sternum haud marginatum."

Medmassa bicolor, nov. sp. (Pl. XVI., Fig. 4).

Cephalothorax black-brown, with fine granulations on the surface, and white closely-lying feathered hairs in patches round the margin and along the median line.

The mandibles are black-brown at base, apex and fangs not so dark a brown; upstanding long brown hairs.

Lip and maxillae, brown, with reddish orange edges. Sternum, black-brown, with fine down-lying white hair. Abdomen, black-brown, with irregular patches of white feathery hair on both upper and lower surface. Spinnerets and epigyne rather lighter.

The coxae of all legs, and whole of the two rear pairs of legs are black-brown, as is also the upper half of the femur of the two front pairs; the remainder of these two pairs, bright orange-yellow. White feathery hair interspersed with upstanding brown bristles on the darker portions, and brown hair on the yellow parts.

The *Cephalothorax* is moderately convex, rather long ovate, square in front, and rounded at the sides, faint shallow depressions separating the thoracic from the cephalic part, with two more at each side. A short median furrow at head of rear slope.

The *Mandibles* are conical, strongly kneed at base, longer than patella, and as thick as femur of front legs. Only two teeth visible on inner edge of falx sheath.

The rear row of *Eyes* is strongly procurved. They are equal in size; the two middle three-quarters of a diameter apart, and one diameter from the side. The front edges of the front row are in a straight line; the middle the same size as the rear, three-quarters diameter apart; the side eyes, oval and smaller, almost touch the middle; the end of their long diameter, which slopes upwards and outwards, is the diameter of the larger eyes distant from the rear side. The median quadrilateral is clearly longer than broad.

The *Maxillae* are upright, convex, the upper margin slightly, and the outer more strongly curved, they are broadest across the

middle. The *Lip* is broader than long, less than half the length of the maxillae; truncate in front, narrowing from about the middle of the sides to both front and rear. Both lip and maxillae have broad upper and inner margins sloping to the edge.

The *Sternum* is cordate, convex, with a short point at the rear, not quite reaching between the rear coxae, which are one-fourth of their width apart. It rises rather abruptly from a quite flat margin, and thence curves slightly to the median line.

The *Abdomen* is ovate, straight in front, rather pointed at the rear end, rounded at the sides.

The spinnerets are two-jointed, short and stout, the inferior and superior pairs of equal length, the lower joints cylindrical, the upper quite short and hemispherical. They almost touch one another at the base, and a hard fold of membrane encloses the whole group.

The *Legs* are long, and fine at the extremities, the femoral joints being flat at the sides, and curved outwards on the upper and lower edges; a double row of long upstanding spines on the underside of the tibial and metatarsal joints of all legs; claw tufts on all tarsi, but no scopula.

Female	-	Ceph.	- $3\frac{1}{2}$ mm. long.	-	$2\frac{1}{2}$ mm. broad.
		Abd.	- 5 ,, ,,	-	3 ,, ,,

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1	- $1\frac{1}{2}$ mm.	- $3\frac{1}{2}$ mm.	- $3\frac{3}{4}$ mm.	- 4 mm.	= $12\frac{3}{4}$ mm.
2	- $1\frac{1}{2}$,,	- 3 ,,	- $3\frac{1}{2}$,,	- $3\frac{3}{4}$,,	= $11\frac{3}{4}$,,
3	- $1\frac{1}{2}$,,	- 3 ,,	- $3\frac{1}{4}$,,	- $3\frac{3}{4}$,,	= $11\frac{1}{2}$,,
4	- $1\frac{3}{4}$,,	- $3\frac{1}{2}$,,	- $4\frac{1}{2}$,,	- $5\frac{1}{2}$,,	= $15\frac{1}{4}$,,

or, 4, 1, 2, 3.

Medmassa fusca, nov. sp. (Pl. XVII., Fig. 1.).

Cephalothorax, brownish yellow, the colour darkening towards the margin, and about the eyespace where it is dark brown. White plumose hair in patches along the median line. Mandibles, yellowish brown, with a few fine upstanding brown hairs; fangs reddish brown. Lip and sternum, dark brown; maxillae, lighter, with broad pale dingy yellow edging. Abdomen, black-brown above, lighter brown below, with very fine down-lying simple hairs pointing rearwards on the back, and patches of white plumose

hairs; the most pronounced forming greyish spots on each side, about half way down. The femur of all legs is a dingy yellow-grey, the front pairs being paler and the rear pairs darkest. The other joints are lighter in colour, and have white hairs.

The *Cephalothorax* is oblong, truncate in front, slightly rounded at the sides. The cephalic and thoracic parts separated by a broad shallow depression. The median sulcus runs from the front part of the pars thoracica to the rear slope. A raised marginal fold surrounds the whole cephalothorax, and the eyespace is also slightly raised.

The rear row of *Eyes* are equal and nearly equidistant, procurved about one and a half diameters apart, but the middle pair slightly farther from each other than from the side. The front row viewed from above is straight, the diameters being the same size, but the side eyes oval. The two middle eyes are on a distinct prominence, two diameters apart, and are touching the side eyes, consequently viewed from in front the row is procurved. The eyes of the side pairs are a diameter apart. The clypeus equals in breadth the diameter of the front middle eyes.

The *Mandibles* are conical, kneed at base, longer than the front patellae, and as thick as front femora.

The *Maxillae* are upright, parallel, slightly curved in front, convex, and slightly curved on outer edge, broadest across the middle.

The *Lip* is wider than long, rounded in front, and less than half the length of the maxillae.

The *Sternum* is broad, heart-shaped, convex, rising rather suddenly from a flat margin.

The *Abdomen* is a long oval, rounded at the sides, and rather pointed both at front and rear.

The *Legs* are fine, the femur not so much thickened as in M. bicolor, from which it may be easily distinguished by the front row of eyes, which are equal in breadth, the middle being farther from one another than from the side.

Ceph.	- -	$2\frac{3}{4}$ mm. long.	-	$1\frac{3}{4}$ mm. broad.
Abd.	- -	4 „ „	-	$2\frac{1}{2}$ „ „

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1	$\frac{3}{4}$ mm.	$2\frac{1}{4}$ mm.	2 mm.	$2\frac{1}{4}$ mm.	= $7\frac{1}{4}$ mm.
2	$\frac{3}{4}$ „	2 „	$1\frac{3}{4}$ „	2 „	= $6\frac{1}{2}$ „
3	$\frac{3}{4}$ „	2 „	$1\frac{3}{4}$ „	2 „	= $6\frac{1}{2}$ „
4	1 „	3 „	$2\frac{3}{4}$ „	$3\frac{1}{2}$ „	= $10\frac{1}{4}$ „

In M. flavipes, L. K., the legs are wholly yellowish brown, and in M. albopunctata, H. R. Hogg, black all over, with white patches of plumose hair. In M. bicolor the front middle eyes are much larger than the side, and the black cephalothorax and abdomen, with yellow two front pairs of legs, are distinctive features. M. semiflava, E. Sim., has a yellowish brown cephalothorax, with front, middle, and side eyes apparently about the same as M. bicolor, from which the black cephalothorax easily distinguishes it.

M. Eugene Simon (*loc. cit.* vol. ii., p. 320) divides his family of Lycosidae into, among other groups, Lycoseae and Pardoseae, the members of the former being distinguished by having the lip longer than broad, and metatarsus IV. shorter than patella cum tibia IV.

In Pardoseae the lip is shorter than broad and metatarsus IV. as long as or longer than patella cum tibia IV.

In the species described below the lip is distinctly less in length than in breadth, the characteristic of Pardosa, but metatarsus IV. is also distinctly shorter than patella cum tibia IV., thus possessing characteristics specially distinctive of each of the two groups.

The lip makes it a Pardosa, C. Koch, and it certainly does not conform to Lycosa, Latreille, in respect of that organ. The third tooth of the lower falx edge is *not* "much smaller than the first and second," as they are all nearly equal, the middle being rather the largest, but not materially so. For the present, therefore, I am obliged to make my three new species, all of which are alike in the above details, into a new genus, which I call Venator.

VENATOR, gen. nov.

The genus Venator will differ from Pardosa in having metatarsus IV. shorter than patella cum tibia IV. and three large teeth on the lower falx sheath margin nearly the same size, as in Lycosa.

Type V. spenceri.

Venator spenceri, nov. sp. (Pl. XVII., Fig. 2).

Cephalothorax brownish yellow at sides, with paler median stripe of yellowish grey reaching from the second row of eyes to the upper part of the rear slope; a similar band of colour round the side edge, deeply scalloped above into the side slope of dark grey and brown hair; a black transverse band along the division between the cephalic and thoracic parts slopes forward to rear of the front corner.

The mandibles, black-brown, have a thick mass of yellow-brown hair on the upper half, mingled with black upstanding hairs, which continue to the falx margin. The fangs dark reddish brown, paler at the points. Lip and maxillae dark brown, paler at the edges, with black upstanding hairs and dark grey fringe.

Sternum black-brown, with black, upstanding hair. The front two coxae on each side black-brown, the two rear pair pale chestnut-brown, with pale yellow hair.

The abdomen above brownish yellow, mottled with black patches and yellow and white hairs. A triangular black marking at forward end has the lower corners continued into wings. This is succeeded by a second, similar, but smaller, followed by a third smaller still. Behind this again are three circles of black, lying transversely across the rear end. The epigyne is brown, and the spinnerets greyish yellow.

The sides are more closely mottled with black spots on a grey ground, in places converging into transverse lines. Underneath is a yellow ground, with a transverse black field, reaching from the epigyne to half-way to the spinnerets, straight in front and curved towards the rear. The legs and palpi are a bright brownish yellow on femoral joint, deepening into greyish yellow on the other joints, with black and grey hairs. A dark grey band passes across the upper side of femur at anterior end, and underneath the end of tibia is a similar streak. The spines are pale brown; scopulae of yellowish brown on tarsi and metatarsi of first and second pairs, and on tarsi of third and fourth.

The *Cephalothorax* is longer than patella cum tibia IV., and 1⅓ mm. longer than greatest breadth, where it is as broad as metatarsus IV. is long. It is highest at the rear row of eyes,

whence it slopes gradually to the rear slope, which is steeper and covered by the abdomen.

The front row of *Eyes* has the centres in a straight line, and is narrower than the second row. The middle eyes are twice the diameter of the side eyes, and all separated by a distance equal to half diameter of side eyes. The front middle eyes are their diameter from the eyes of the second row, and the same distance from the margin of the clypeus.

The eyes of the second row are twice the diameter of the front middle, and they are half that distance apart. They are their diameter from those of the third row, which are slightly smaller, and twice their own diameters apart.

The *Mandibles* are longer than the front patellae, and as long as the front tibiae. They are arched at the basal half, where they are thickly covered with down-lying hairs. They have bare basal spots, and on the lower half, and the inner edge of the upper, are sprinkled with upstanding bristly hairs. They narrow to the front margin, where they are cut off rather straight. The fangs are strong and well curved; on the inner margin of falx sheath are three large teeth, of which the middle is slightly the largest; on the outer edge half way down are two teeth, the upper much the largest.

The *Maxillae* are arched, broadest at the upper end, curved on the outer edge, and are slightly incurved over the lip. Both lip and maxillae have a fair sprinkling of upstanding bristles. The *Lip* is one-third broader than long, broadest about half way between base and anterior margin, which is straight with a broad sloping edge, and slight indentation in middle. It narrows to the base, and is barely half the length of the maxillae.

The *Sternum* is a broad oval, well raised up at the outer edge, but moderately flat. It is thinly sprinkled with long upstanding bristly hair.

The *Abdomen* is ovate, broadest towards the rear, rather straight in front, rounded and high at the sides, rounded at rear, covered with coarse thick down-lying hair, and a few upstanding bristles.

The *Legs* are clothed with short down-lying coarse hairs and thin upstanding bristles, the femoral joints not so thickly covered as the remainder. The metatarsi and tarsi of the anterior two pairs have a scopula. On the upper side of all the femora are

three spines, two long and one short in front. On tibiae III. and IV. are two spines 1.1. above. The metatarsal joint of the fourth pair is distinctly shorter than patella cum tibia.

Ceph.	-	6 mm. long.	-	$4\frac{1}{2}$ mm. broad.
Abd.	-	$7\frac{1}{2}$ „ „	-	$5\frac{1}{2}$ „ „

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1	2 mm.	6 mm.	5 mm.	$5\frac{1}{2}$ mm.	= $18\frac{1}{2}$ mm.
2	2 „	5 „	$4\frac{1}{2}$ „	$5\frac{1}{4}$ „	= $16\frac{3}{4}$ „
3	2 „	$4\frac{1}{2}$ „	4 „	5 „	= $15\frac{1}{2}$ „
4	2 „	6 „	5 „	$(4\frac{1}{2}, 2\frac{1}{2}) = 7$ „	= 20 „

or, 4, 1, 2, 3.

Venator fuscus, nov. sp. (Pl. XVII., Fig 3).

Female.—Cephalothorax black-brown on the sides and front, dark reddish brown along the median stripe; a band of rather thick, down-lying, pale yellow hair round the margin, on the median stripe, round the eyes and on clypeus; thinly-spread white and black hairs and black bristles on remainder.

The mandibles are black-brown, with yellow-brown hair on the upper half; thin, black, upstanding bristles all over; and a thick bush of black and grey hair covering the outer falx edge. The fangs are a rich shiny black, paling to reddish brown near the point. Maxillae, lip and sternum are black-brown, with long, upstanding black hair and bristles; fringe on edge of maxillae grey-brown. The upper surface of abdomen, sides and underneath black, with short, thick, dark grey hair and black bristles. On underneath two longitudinal stripes of thick yellowish white hair, reaching from the pulmonary fold two-thirds of the distance to the spinnerets.

The legs and palpi are reddish brown on coxae, darkening towards the extremities, with dark grey down-lying hairs, black bristles, and black-brown spines.

The *Male* is paler, but rather brighter coloured. The longitudinal median stripe on the back is yellow haired, and there is a similar coloured band round the sides of the abdomen.

The *Cephalothorax* is one-third longer than its width between second and third pairs of legs, and clearly longer than patella

cum tibia IV. It is highest in the middle of the cephalic part, sloping gradually thence to rear of thoracic part.

The *Mandibles* are long and powerful, somewhat drawn to the rear. In the female they are nearly twice as long as the patellar and equal to the tibial joint of the front pair of legs; about one and a half of patella in male. The lower end of the falx is only slightly narrower than the upper, which is kneed. They are covered with a thick bush of hair so long as to quite conceal the edge. The fang is long and stout, and rather straight. On the inner margin of the falx sheath are three large teeth, of which the middle is slightly larger than the other two.

The front row of *Eyes* is broader than the middle row. The front middle eyes are one and a half times as broad as the side, two-thirds of their diameter apart, and barely their diameter from the middle row. The latter are two-thirds of their diameter apart. The rear eyes, three-quarters the diameter of the second row eyes, are one and a half of their diameter away from same, and three times their diameter apart. The clypeus equals in breadth the diameter of the front middle eyes.

The *Maxillae* are arched, broadest in front, where they are slightly rounded; a thick fringe of long hair on the inner half of the front edge, and of shorter hair on the inner slope.

The *Lip* is barely half the length of the maxillae, arched transversely, with a broad front edge hollowed out; it is distinctly broader than long.

The *Sternum* is a broad oval, well raised up from its bed, from which it is nearly as high at the edges as in the middle. It is thickly clothed with upstanding, bristly hair.

The *Abdomen* is long ovate, broadest one-fourth from the rear end, rather high at the sides.

The *Palpi* are slightly shorter than the cephalothorax, the femoral joint thickened in front and curving inwards. The tibial joint is longer than the patellar, all rather thickly haired.

The *Legs* are stout, with a thick scopula on tarsus and metatarsus of all legs. On all the legs the femur has two long and one shorter spine on upper side. Metatarsus IV. is shorter than patella cum tibia IV.

Female	-	Ceph.	-	10 mm. long.	-	7½ mm. broad.
		Abd.	-	9 „ „	-	6 „ „

		Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs	1	- 3 mm.	- 7 mm.	- 7½ mm.	- 7 mm.	= 24½ mm.
	2	- 3 „	- 6½ „	- 7 „	- 6½ „	= 23 „
	3	- 3 „	- 6 „	- 6 „	- 6 „	= 21 „
	4	- 3 „	- 8 „	- 8 „	6½ } 3 } 9½ „	= 28½ „

Male - Ceph. - 8 mm. long. - 6 mm. broad.
Abd. - 7 „ „ - 4½ „ „

		Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs	1	- 2½ mm.	- 6 mm.	- 7 mm.	- 8½ mm.	= 24 mm.
	2	- 2½ „	- 5½ „	- 6 „	- 7½ „	= 21½ „
	3	- 2½ „	- 5 „	- 5 „	- 6½ „	= 19 „
	4	- 2½ „	- 7 „	- 7 „	- 9 „	= 25½ „

Venator marginatus, nov. sp. (Pl. XVII., Fig. 4).

Cephalothorax black-brown, with a narrow white or yellow edging along the margin the whole way round; parallel to this a narrow brown intermediate line, and then a broad band of yellow or white hairs. The cephalic part above this is yellow-brown, merging into the median stripe of the same colour which runs to the rear slope; between the median and side stripes on the thoracic part there is a wide space of dark grey and black; on the face are black bristles. The mandibles are black-brown, thickly covered for two-thirds down with coarse yellow hairs and bristles, the lower third dark brown with black hairs. Fangs black-brown.

The lip and maxillae are a dirty dark red-brown, with paler edgings scantily covered with upstanding pale brown hair. The sternum is pale yellow-brown, with still paler coarse upstanding yellow hair. The legs and palpi are pale yellow-brown, darkening to orange at the joints, with pale yellow-brown hair, and darker upstanding bristles; the spines, dark brown; on the outer side of each femur is a darker brown longitudinal stripe. The abdomen above is of a dark grey ground colour, with two curved longitudinal pale yellow-brown stripes meeting in front and at rear just above the spinnerets.

The intermediate space is divided transversely into a series of nine triangular markings, of which the rather paler apex of each

fits into the hindward curved darker base of the one in front of it. The sides are yellow, mottled with dark grey, and the under side a thick mat of down-lying coarse pale yellow hair. Spinnerets and epigyne, bright brown.

The *Cephalothorax* is longer than patella cum tibia IV., 2½ mm. longer than the width between second and third pairs of legs; rounded at the sides. The face is trapezoidal seen from the front, widening out between the palpi, and rather high in the middle. The middle ridge runs about level to rear slope, where it descends at a steep angle. The hairing is close and smooth, with upstanding bristles between the eyes and on the forehead.

The front row of *Eyes* are barely as wide as the second, the two middle of the front row being twice the diameter of the front side, a semi diameter of the same apart. The *Clypeus* is scarcely the width of the front middle eyes, and the latter are half their diameter from those of the second row.

The second row eyes are half their diameter apart, and twice the diameter of the front middle eyes. The eyes of the rear row are the diameter of the second row eyes away from them. They are one and a half diameters of front middle eyes, and two and a half of their own diameters apart.

The mandibles are longer than the front patellae, kneed at base, and then slightly recedent, thickly covered to end of falx with down-lying hair. The fangs are long and stout. There are three large teeth on the inner edge of falx sheath, the middle slightly the largest.

The *Maxillae* are transversely arched, narrowed at base, rounded in front and at the outer side; on the inner slope thickly fringed, and the whole surface covered with thin upstanding hairs. They are slightly sloping over the *Lip*, which is distinctly wider than long, transversely arched, hollowed in front, and narrowed at rear. It is about half the length of the maxillae.

The *Sternum* is heart-shaped, pointed at rear, where the coxae are close together. It rises somewhat abruptly at the margin, and is thence slightly arched to the centre. The irregular upstanding coarse hair is longer at the margin than near the centre.

The *Abdomen* is ovate, rounded in front and rear, broadest one-third from the rear, thickly covered with close lying hair

much coarser on the under side. The superior *Spinnerets* are rather longer than the inferior, with very short second joints.

The *Palpi* are shorter than the cephalothorax, the femoral joint curved inwards, and broadening to anterior end. The tibial joint is longer than the patellar.

The *Legs* are thickly covered with short down-lying hair and upstanding bristles; all tarsi are scopulated, and the rear metatarsi thinly so. The rear metatarsus is shorter than patella cum tibia of same.

Ceph.	- 8 mm. long.	-	5½ mm. broad.
Abd.	- 7 " "	-	5 " "

	Coxa.	Tr. & Fem.	Pat. & Tib.	Met. & Tars.	
Legs 1	- 2½ mm.	- 6 mm.	- 7 mm.	- 6 mm.	= 21½ mm.
2	- 2½ "	- 6 "	- 6 "	- 6 "	= 20½ "
3	- 2½ "	- 6 "	- 6 "	- 6 "	= 20½ "
4	- 3 "	- 8 "	- 7 "	6} 3} 9 "	= 27 "

or, 4, 1, 2, 3.

EXPLANATION OF PLATES XIII. TO XVII.

Plate XIII.

Fig. 1.—Amaurobius pilosus. Male. 1*a*, eyes. 1*b*, palp. 1*c*, posterior end of sternum.

Fig. 2.—Hylobius divergens. Female. 2*a*, eyes. 2*b*, epigyne. 2*c*, cribellum of female. 2*d*, rear coxae and end of sternum.

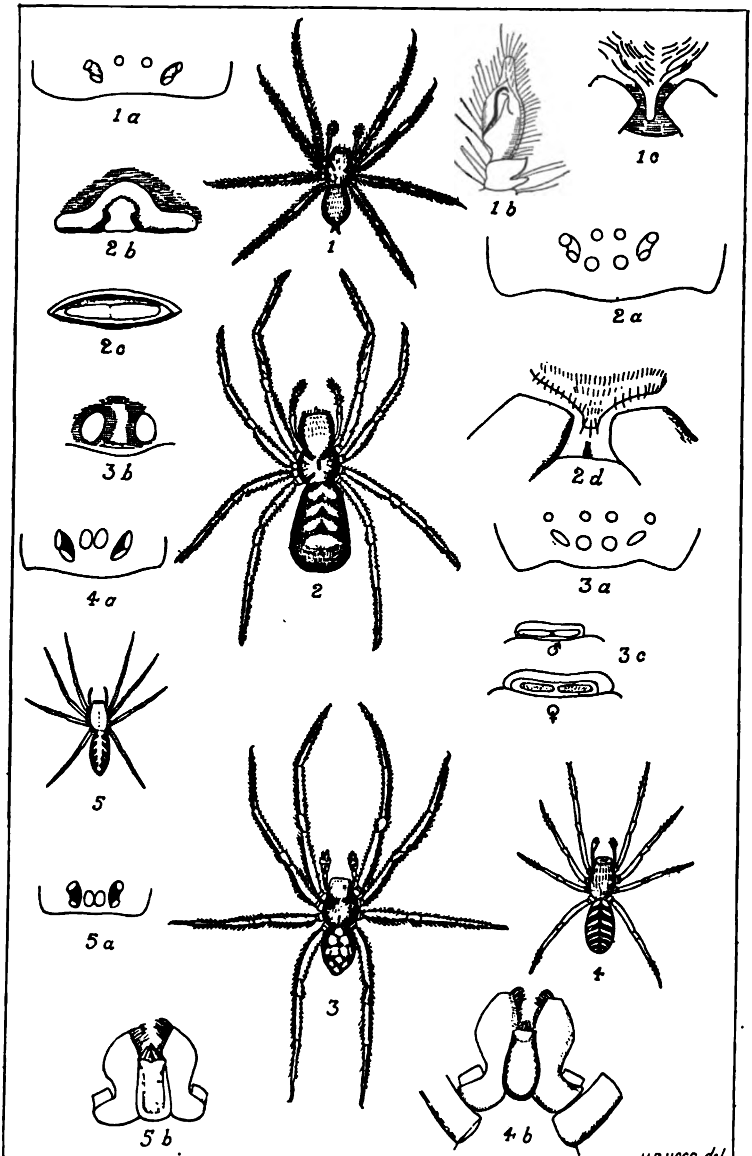
Fig. 3.—Hylobius punctatus. Female. 3*a*, eyes. 3*b*, epigyne. 3*c* cribellum of male and female.

Fig. 4.—Macedonia burchelli. Female. 4*a*, eyes. 4*b*, lip, maxillae and part of sternum.

Fig. 5.—Gippsicola raleighi. Female. 5*a*, eyes. 5*b*, lip and maxillae.

Plate XIV.

Fig 1.—Drassus debilis. Female. 1*a*, eyes. 1*b*, epigyne. 1*c*, lip and maxillae. 1*d*, spinnerets from above.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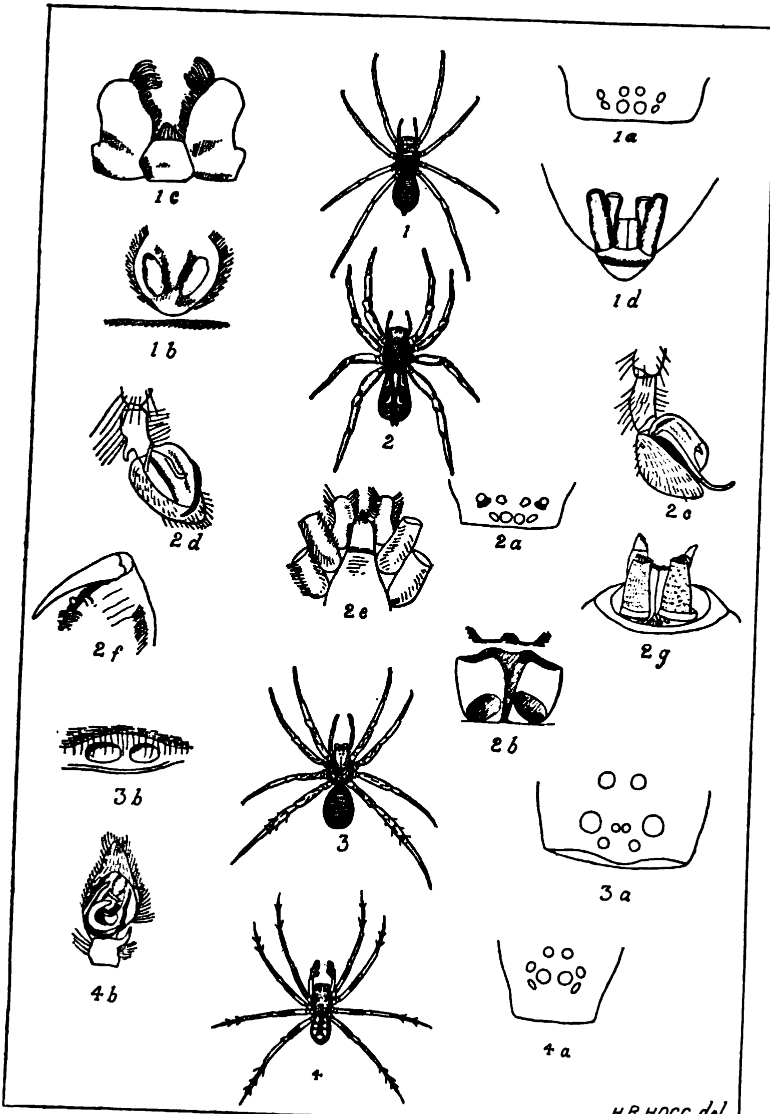
H.R.HOGG del.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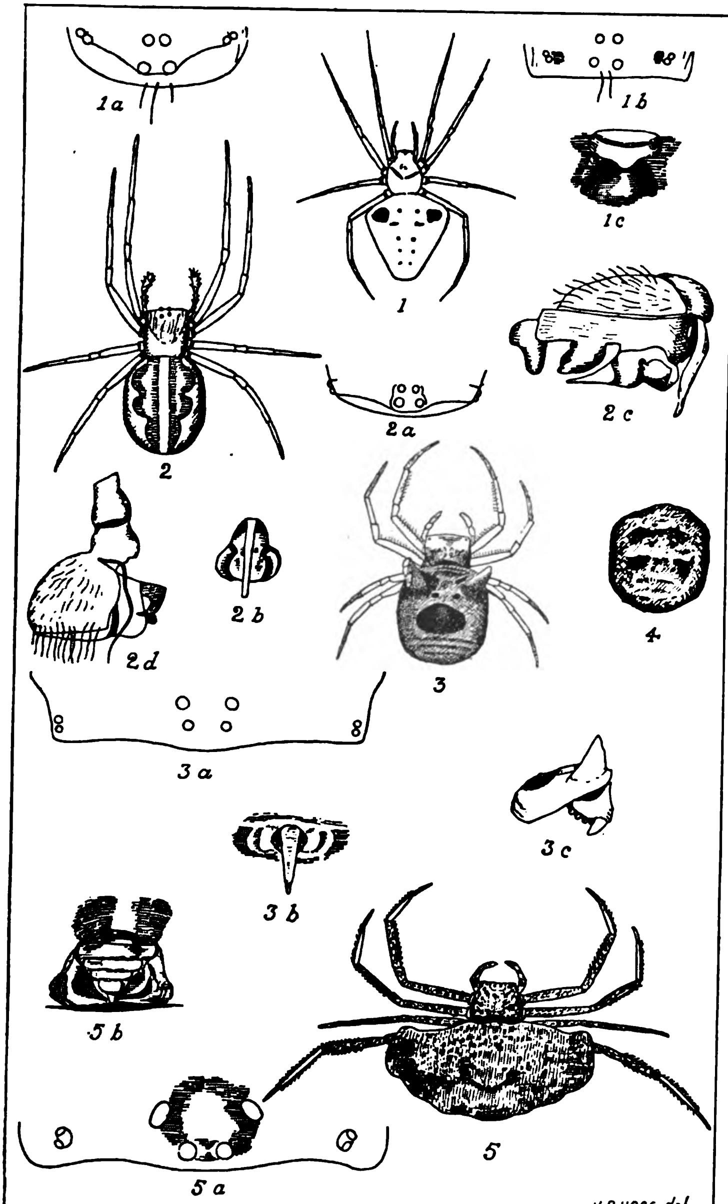
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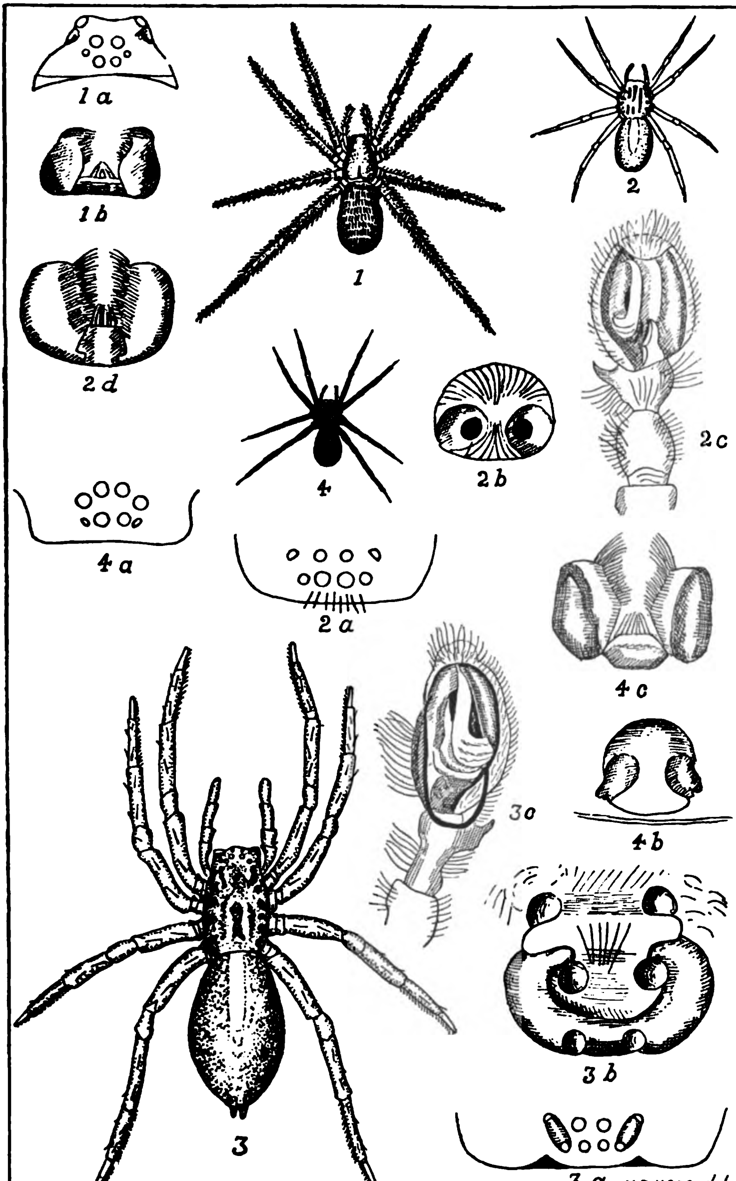
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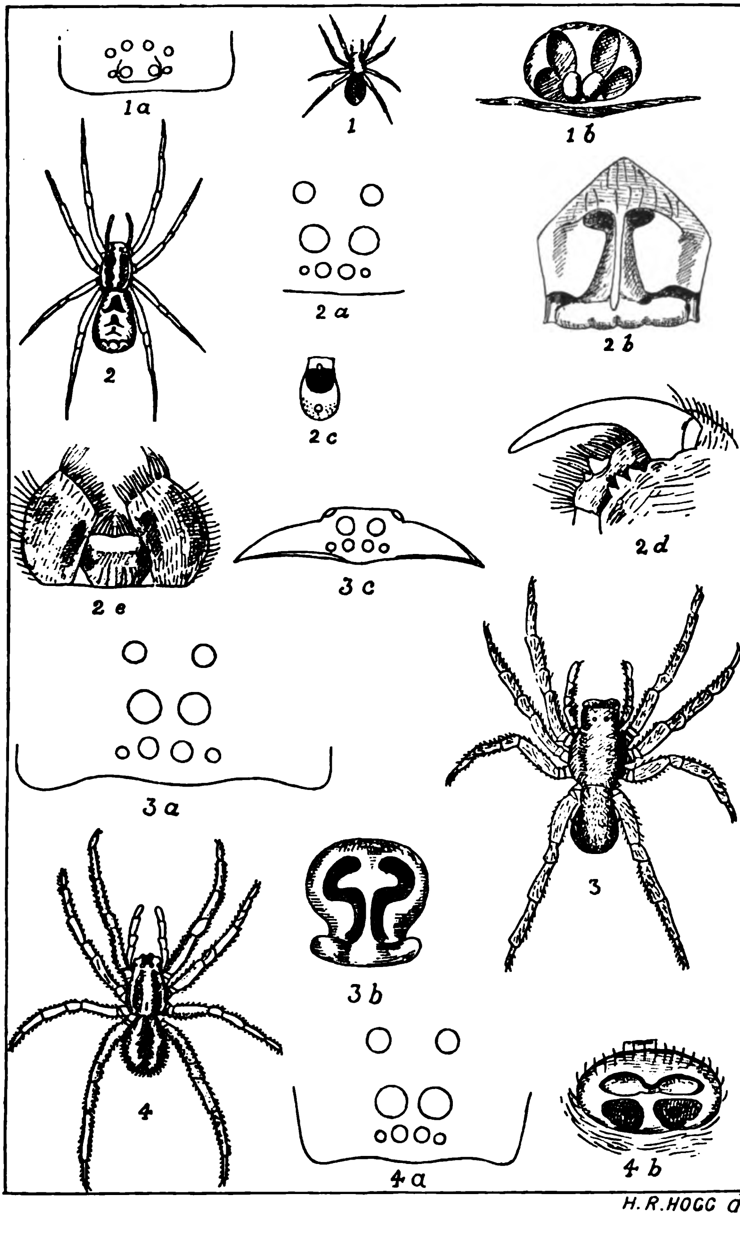

H. R. HOGG *del.*

Fig. 2.—Gnaphoisoides signatus. Female. 2*a*, eyes. 2*b*, epigyne. 2*c* and 2*d*, male palp in two positions. 2*e*, lip, maxillae and part of sternum. 2*f*, falx. 2*g*, spinnerets.

Fig. 3.—Storenosoma lycosoides. Female. 3*a*, eyes. 3*b*, epiygne.

Fig. 4.—Storena macedonensis. Male. 4*a*, eyes. 4*b*, male palp.

PLATE XV.

Fig 1.—Araneus memorii. Female. 1*a*, eyes from above. 1*b*, eyes from in front. 1*c*, epigyne.

Fig. 2.—Araneus scutigerens. 2*a*, eyes. 2*b*, epigyne. 2*c* and 2*d*, male palp from front and side.

Fig. 3.—Cyrtarachne latifrons. Female. 3*a*, eyes. 3*b*, epigyne. 3*c*, body in profile.

Fig. 4.—Cyrtarachne latifrons *var.* atuberculata. Upper side of abdomen.

Fig 5.—Dolophones maximus. Female. 5*a*, eyes. 5*b*, epigyne.

PLATE XVI.

Fig. 1.—Argoctenus pectinatus. Female. 1*a*, eyes and face. 1*b*, lip and maxillae.

Fig. 2.—Syspira rubicunda. Female. 2*a*, eyes. 2*b*, epigyne. 2*c*, male palp. 2*d*, lip and maxillae.

Fig. 3.—Miturga maculata. Female. 3*a*, eyes. 3*b*, epigyne. 3*c*, palp of male.

Fig. 4.—Medmassa bicolor. Female. 4*a*, eyes. 4*b*, epigyne. 4*c*, lip and maxillae.

PLATE XVII.

Fig. 1.—Medmassa fusca. Female. 1*a*, eyes. 1*b*, epigyne.

Fig. 2.—Venator spenceri. Female. 2*a*, eyes. 2*b*, epigyne. 2*c*, underside of abdomen. 2*d*, falx. 2*e*, lip and maxillae.

Fig. 3.—Venator fuscus. Female. 3*a*, eyes. 3*b*, epigyne. 3*c*, eyes and face.

Fig. 4.—Venator marginatus. Female. 4*a*, eyes. 4*b*, epigyne.

Art. VI.—*Janirella, a New Genus of Isopoda from Fresh-water, Victoria.*

By O. A. SAYCE.

(Plates XVIII. and XIX.)

[Read 10th May, 1900.]

The Isopod here described I collected from a small fresh-water pool at Thorpdale, Gippsland, at the same time and place that I took *Phreatoicoides gracilis* and *Niphargus pulchellus*. In my two papers describing these forms[1] I mentioned the locality in some detail. The present species was an inhabitant of the same little pool as *N. pulchellus*.

It is a normal member of the family Janiridae as defined by Sars in 1897,[2] except in being blind, and in this respect it agrees with the Isopod and Amphipod mentioned above. It is also remarkable as having a fresh-water habit. Sars, in his remarks on the family, says that, "all the known forms are exclusively marine, and, as it were, replace the Asellidae in the oceans"; but I might point out that *Jaera guernei*, Dollfus (the genus being undoubtedly of this family) had previously been recorded as an inland river species of the Azores.[3]

It seems necessary to form a new genus for the present species, and, because of its possessing many characters in affinity with both *Janira* and *Janiropsis*, I propose to name it *Janirella*.

Janirella, n. g.

General Characters.—General form of female that of *Janira*; the male is smaller, with each segment wider, or at least as wide, as the preceding one; in other respects, except in the pleopodos, similar in form in both sexes. Caudal segment large, as long, or longer, than broad, rounded distally. Segments of peraeon with lateral margins not laciniate. Superior antennae small, with flagellum rudimentary. Inferior antennae very much elongated,

1 Proc. Royal Society Victoria, vol. xii., pp. 122 and 152.

2 Sars, Crustacea of Norway, ii., pts. 5, 6, p. 98.

3 Stebbing, History Crust. 1893, Int. Sc. Series lxxiv., p. 379.

with a well marked cylindriform appendage outside the third joint of peduncle. First maxillae with outer lobe tipped with stout pectinated spines. Second maxillae with outer twin lobes tipped with finely pectinated setae. Maxillipeds normal, second and third joints of "palp" not greatly expanded. Legs simple, biunguiculate, ambulatory, similar to each other in form. Uropods largely developed, cylindriform; outer ramus much shorter than inner one. Pleopods normal; operculum of female large; middle piece of male operculum slightly, or not at all, dilated at tip.

Remarks.—This genus unites in a measure the characters of *Janira* and *Janiropsis* as defined by Sars;[1] as well as possessing characters dissimilar from each.

From *Janira* it differs:—(1) The superior antennæ are not composed of "numerous short articulations." (2) The second pair of maxillae have the outer lobes tipped with pectinated, not "simple setae." (3) The first pair of legs have not the carpus large and strongly prehensile. (4) The dactyli of the legs are not 3-unguiculate.

From *Janiropsis* it differs:—(1) The maxillipeds have not the "second and third joints of the palp very much expanded." (2) The first pair of legs of the male are not "remarkably developed, prehensile, much longer than any of the other pairs, with the carpal joint fusiformly developed." (3) The middle piece of the male operculum is not "remarkably dilated at the tip." (4) The uropoda are not "much shorter" than those of *Janira.*

It is peculiarly characteristic in: (1) The form of the male, (2) The legs are subequal and similar in form in both sexes. The dactyli, although biunguiculate, as in *Janiropsis* terminate in a long simple unguis, near which is a small lateral one. (3) The caudal segment is very large. (4) The uropoda are cylindriform and have the outer ramus very short.

Janirella pusilla, n. sp.

Specific Character.—Female. (Fig. 1) Body oblong-oval, three times longer than broad, outer margins of all segments except front of cephalon fringed with short stout spinules—

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1 *Loc. cit.*

Cephalon small, transversely suboblong, subequal in length to succeeding segments, anterior margin slightly obtusely produced in the middle. Segments of peraeon with lateral margins evenly rounded. Coxal plates inconspicuous—Caudal segment large, subovoidal, longer than its greatest breadth, as long as the four preceding segments combined, posterior margin between the uropods slightly produced and evenly rounded. Eyes not formed. Superior antennae not reaching to the end of the penultimate peduncular joint of the inferior ones, flagellum composed of about four joints. Inferior antennae exceeding the length of the body, flagellum more than twice the length of the peduncle and composed of about 38 articuli; appendage outside third joint of peduncle cylindriform, prominent. Legs slender, increasing in length posteriorly. Operculum completely covering caudal segment. Uropods narrow, long, subequal in length to caudal segment, outer ramus small, about one-third the length of inner ramus, inner ramus twice the length of peduncle.

Male.—(Fig. 2) Body narrow—elliptical, narrowest anteriorly, two and a quarter times longer than its greatest breadth. Caudal segment very large, sub-spherical. Middle piece of operculum with the end triangularly cleft mesially, and on each side of this cleft margin slightly concave; lateral distal angles slightly produced, bilobate. Similar in other respects of form to female.

Colour—Pale ochreous, without markings. Spirit specimens pale yellow.

Length—♂ 3 mm. ♀ 3·5 mm.

Habitat.—Fresh-water pool, Thorpdale, Victoria.

Detailed Description.

An external examination was made of eleven specimens composed of males and females, and some of the latter had developing young in the marsupium. The largest female measured 3·5 mm. and the largest male 3 mm. One of each sex was dissected, which I shall now describe in some detail.

Female.

Body (Fig. 1).—The body is oblong-oval in form, three times as long as it is broad, and slightly narrowed both in front and behind. The greatest breadth is at the third and fourth segments

of the peraeon. The lateral margins of the cephalon and each succeeding segment is fringed by a row of short stiff spinules. The *Cephalon* is small, transversely suboval, subequal in length to the succeeding segment, with the anterior margin slightly produced and bluntly rounded between the antennae. The lateral margins are slightly expanded. The *Eyes* are not formed nor is there any appearance of lenses nor pigment, but in some specimens there is a very slight appearance of two round areas, indicated by somewhat lighter colour, where the eyes would normally be, but it is doubtful if these are vestigial remnants of former functioning eyes. The *Peraeon* (mesosome) has the seven segments each clearly defined, slightly dorso-ventrally arched, and the lateral margins of each are simple, bluntly rounded, and cover the coxa of the appendages. The *Pleon* (or metasome) is of normal form, very large, longer than its greatest breadth, and as long as the four preceding segments combined. The posterior margin between the uropods is very slightly produced and rounded. The lateral and posterior margins are entire and fringed with short spinules.

Superior Antennae (Fig. 1).—The superior antennae reach somewhat beyond the middle of the fifth joint of the inferior antennae. The basal joint is very stout, the second and third much narrower, and the remaining portion—the flagellum—is composed of three or four joints. The distinction between flagellum and peduncle is, however, not clearly marked. The terminal joint is richly tipped by so called "olfactory" and feathered "auditory" sensory setae; occasionally also from other parts arises a feathered sensory seta.

Inferior Antennae (Fig. 3).—The inferior antennae measures as long as the body and uropods combined. It is fixed under the arched frontal margin of the cephalon. The peduncle, which is composed of six joints, is about twice the length of the superior antennae; the first joint is subquadrate, the second transverse, the third as long as the first two combined, and mesially, from the outer margin, arises a well marked cylindriform appendage, tipped by long setae. The fourth joint is short and turned obliquely outwards; the fifth is slightly longer than the first four combined, and, close to its attachment to the fourth joint, the outer margin is slightly produced to form, in optical section, an

obtuse angle. The sixth is longer than the fifth. The setae are few and unimportant. The flagellum is formed of about 38 joints.

Upper Lip (Fig. 4).—The upper lip is short, the margin evenly rounded, and distally clothed with a fur of fine setae.

Mandibles (Fig. 5).—The mandibles differ from each other in the cutting edge and spine row. The *left* has two rows of cutting teeth, each of which has six teeth, and a spine row composed of ten serrated spines. The *right* has only one cutting edge, composed of five teeth, and a spine row of thirteen serrated spines. In other respects they are similar to each other. The molar tubercle is normal. The *palp* is composed of three joints, the first two extend to the level of the cutting edge, and are subequal in form, the second being slightly the longest, and bears distally on its lower margin a row of six spatulate setae, with the margins delicately feathered; the two at each end of the row are twice the length of the others. The terminal joint is of similar length to the first joint, slightly curved downwards, with the end rounded, and bearing three plumose setae, and between them and the distal extremity of the second joint the lower margin has six short, stout, plumose setae.

Lower Lip (Fig. 6).—The lower lip is large and formed of two lobes, broadly rounded, with their summits and inner distal margins fringed with fine long incurving setae.

First Maxillae (Fig. 7).—The first maxillae are each composed of two lobes of normal form; the outer one is broad, its outer margin more than usually convex, and bears on its summit about twelve stout pectinated spines; the inner lobe is narrow, and reaches to the extremity of the outer lobe; its bluntly rounded extremity is thickly covered with long simple setae.

Second Maxillae (Fig. 8).—The second maxillae are of usual shape. Each consists of a broad basal portion with the inner distal extremity produced into a lobe, which has the inner margin and extremity fringed with long, filamentous, simple setae. Outside this lobe are two narrow lobes (Fig. 8*a*) similar to each other, which extend almost to the end of the inner lobe; they articulate with the basal portion of the summit, and each is tipped by a few very long, finely-pectinated setae.

Maxillipeds (Fig. 9).—The maxillipeds are almost identical with those of *Janira maculosa*, Leach, but the epipodite (or epignath) has not the outer edge angular in the middle, but rather concave. As in that species, the second and third joints of the "palp" are not much expanded, in contrast to *Janiropsis*, in which they are very broad.

Peraeopods.—The peraeopods are rather long, subequal in form, and each succeeding pair slightly increases in length. Fig. 10 illustrates the first, and Fig. 12 the last pair. A description of the first will suffice for the remainder, except in respect of the setae and spines. The first pair may be, but if so it is very feebly prehensible, for the carpus is not specially developed nor differs from the succeeding pair, as in *Janira*. On the postero-distal angle of the propodos, and also the carpus, there are one or more plumose sensory setae, and along the inner margin of the propodos there is a row of six stout spines of curious shape (Fig. 11). These are rather broad at the base, but narrow to an acute end; at about half their length, on the outer side, there arises a fine filament or seta which curves outward somewhat, and extends as far as the end of the spine. The dactylos is long, about one-third the length of the propodos, slightly curved, and terminates in a large single unguis, and on the inner margin, at its base, there is a short secondary unguis. The remaining joints are subequal in form to *Janira* and other allied genera.

Pleopods.—The pleopods are of normal form. The operculum is as large as the caudal segment, and covers the whole of its ventral surface. The others require no particular description, a reference to (Figs. 14, 15 and 16) will sufficiently explain them.

Uropods.—The form of the uropods has been sufficiently explained in the specific description. There are short scattered setae on the peduncles, but the rami are almost bare except on the rounded extremities, from each of which springs a tuft of very long setae

MALE.

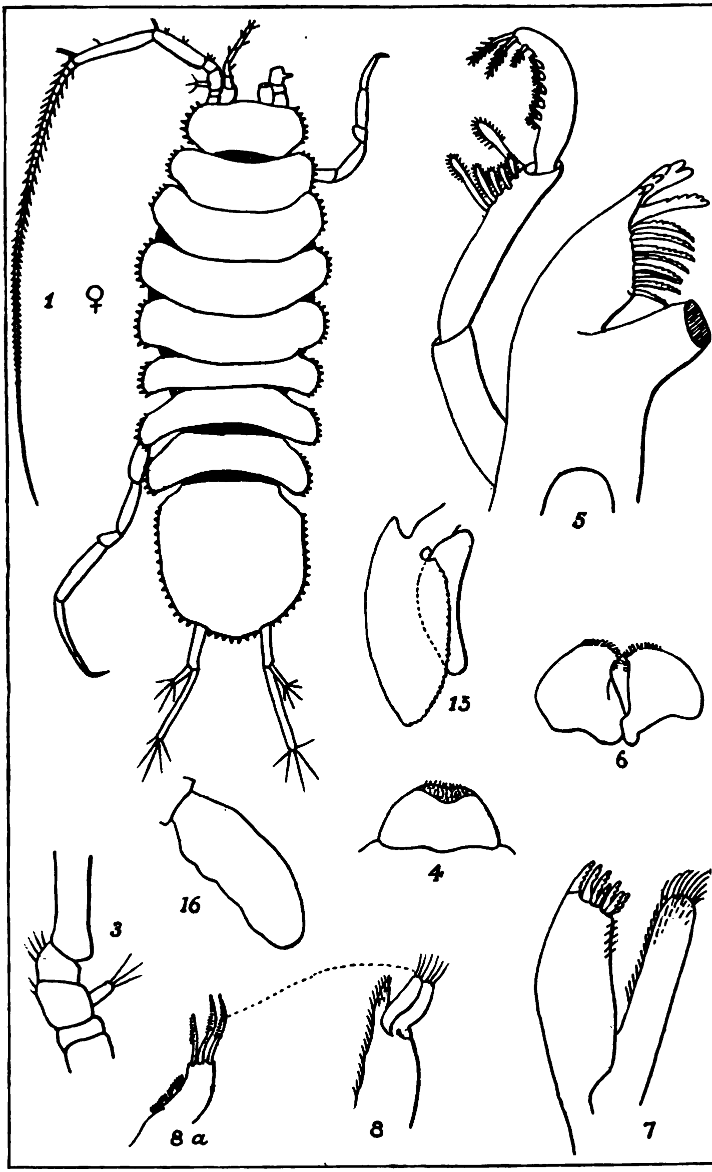
Fig. 2 illustrates a small male of 2·5mm. length but is similar in form to one examined of 3mm. which was the largest obtained. The shape of the cephalon and succeeding four segments is similar to those of the female, but the remaining segments,

instead of gradually becoming narrower, gradually become wider, the caudal segment also participating in a greater width in like degree. The shape of each segment, except in relation to size, is identical with those of the female, the caudal segment however is relatively broader, and consequently subspherical instead of ovoidal in shape.

The only other observed difference from the female is in the pleopods, which are similar in general form to those of *Janira.* The middle piece of the operculum has each outer distal angle slightly produced and bilobate, and the ends of each lobe fringed with setae. The extremity has a triangular cleft in the middle, and the angles thus formed are distally fringed with a row of setae; the margins on each side between these angles and the outer angles are slightly concave and free from setae.

DESCRIPTION OF PLATES XVIII. AND XIX.

Fig. 1.—Dorsal view of female of *Janirella pusilla* × 22.
„ 2.—Dorsal view of male of *Janirella pusilla* × 22.
„ 3.—Portion of inferior antenna × 66.
„ 4.—Upper lip × 66
„ 5.—Mandible of left side × 160.
„ 6.—Lower lip × 66.
„ 7.—First maxilla × 160.
„ 8.—Second maxilla × 66. (*a*). Extremity of outer lobe × 160.
„ 9.—Maxilliped × 66. (*a*). Plate of basos × 160.
„ 10.—First leg of right-hand side × 42.
„ 11.—Extremity of first leg × 200. (*a*). Spine from margin of propodos × 390.
„ 12.—Portion of last leg × 42.
„ 13.—Middle piece of male operculum, outside view × 28.
„ 14.—Third pleopod × 33.
„ 15.—Fourth pleopod × 33.
„ 16.—Fifth pleopod × 33.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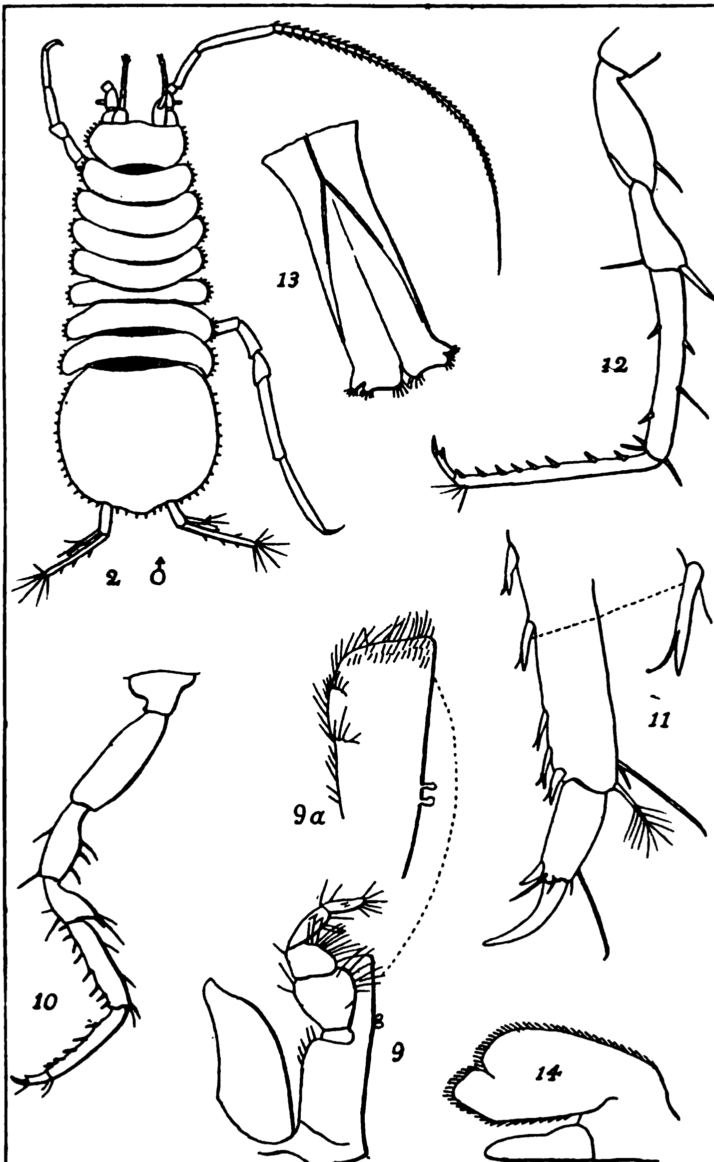
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Art. VII.—*On Some New Species of Victorian Mollusca, No. 4.*

By G. B. PRITCHARD and J. H. GATLIFF.

(Plates XX. and XXI.)

[Read 14th June, 1900.]

As we have already published a number of papers under the above title, without any distinguishing number other than the date of reading and of publication, we have thought it advisable to refer to them in this place with a distinguishing number to prevent any confusion in reference in the future.

No. 1.—On a New Species of Victorian Mollusc (Coralliophila wilsoni). Published May, 1898.

No. 2.—On Some New Species of Victorian Mollusca. Published February, 1899.

No. 3.—On Some New Species of Victorian Mollusca. Published August, 1899.

The present paper includes descriptions and figures of the following species:—

Natica shorehami, sp. nov.
Natica subcostata, T. Woods, with operculum.
Erato denticulata, sp. nov.
Turbonilla (Ondina) micra, sp. nov.
Turbonilla brevis, sp. nov.
Odostomia metcalfei, sp. nov.
Stylifer immaculata, sp. nov.
Marginella whani, sp. nov.

We have to express our thanks and indebtedness to Mr. F. E. Grant for the drawings of these shells.

Natica shorehami, sp. nov. (Pl. XX., Fig. 4.)

Shell very small, solid, conoidally globose, whorls 3½, smooth, excepting at the upper portion of the whorls immediately below the suture, where there are slight radiating grooves, suture defined, spire very short.

Umbilicus covered with a pad that almost fills the umbilical area, the pad sinuously extends to the posterior junction of the columella and outer lip, and is not divided. Aperture lunar-ovate.

Type, white, with a few slight irregular light brown maculations on the body whorl near the outer lip, another specimen has three encircling rows of dots on the body whorl, and the shell has a light violet tint.

Dimensions of Type.—Height, 4 mm.; breadth, 4 mm.

Locality.—Schnapper Point and Portsea, Port Phillip; Shoreham and San Remo, Western Port.

Observations.—Type in Mr. Gatliff's collection.

Natica subcostata, T. Wds.[1] (Pl. XX., Figs. 1, 2, 3.)

Shell small, rather thin, globosely turbinate; whorls, 4; smooth, excepting at the upper portion of the whorls immediately below the well defined suture, radiating from which is a continuous series of strongly defined grooves following at somewhat irregular distances, the width between each groove being about three times the width of the groove in the penultimate and ante-penultimate whorls, these grooves extend almost across the whorls, the area near the suture traversed by them on the body whorl is rather depressed. Spire short. Outer lip semicircular; inner lip somewhat straight. Deeply umbilicated. Columella somewhat thin, with a very small, narrow, slightly concave callosity entering the centre of the umbilical area. White, covered with a thin, pale straw coloured epidermis.

Operculum, calcareous, semilunate, very slightly smaller than the aperture, nucleus small, eccentric anteriorly; outer surface of the operculum slightly concave, somewhat irregularly spirally grooved, one prominent groove in juxtaposition to the outer margin, but two more strongly defined at a short distance from the margin; a slight radial marking is also present, showing most distinctly as a slight crenulation at the outer margin.

Dimensions of Operculum.—Antero-posterior diameter, 3 mm.; breadth, 2 mm.; pertaining to a shell of length, 4 mm., by about the same breadth.

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1 Proc. Linn. Soc. N. S. Wales, 1878, p. 263.

Dimensions of Shell Figured.—Height, 6 mm.; breadth, 6 mm.

Locality.—Dredged in five fathoms, sandy mud, off Phillip Island, Western Port, by C. J. Gabriel.

Observations.—Mr. Charles Hedley kindly compared our specimens with the type in the Australian Museum, Sydney, and considers them identical, with the exception that ours is rather larger and has half a whorl more.

Erato denticulata, sp. nov. (Pl. XX., Fig. 5.)

Shell pyriform, somewhat solid, with a high shoulder and prominent but somewhat small spire.

In addition to the embryonic portion, consisting of about one-and-a-half smooth whorls, there are usually three or four succeeding convex whorls, each whorl enveloping the previous one to such an extent that the suture is not very distinct. Body whorl gradually and evenly tapering to the relatively broad anterior end; but the dorsal aspect shows a slight concavity in the slope just before reaching the anterior extremity. Entire surface smooth and lustrous. Aperture long and narrow, being of greatest width a little below half its length; outer lip strongly thickened and inflected, the thickening commencing at the end twist of the columella, running round the broadly open anterior canal, thence ascending a little more than half way above the suture of the penultimate whorl; outer lip regularly and uniformly denticulate within; columella with about three strong plaits, two prominent denticles at the posterior end of the inner lip, whilst the whole space between is regularly and minutely denticulate. Shell opaque, milky white in colour, but some examples are somewhat translucent through the thin part of the body whorl; a thin band of a violet-brown colour encircles the shell on the shoulder a little below the suture, and terminates at the thickening of the outer lip, there is also a small streak of the same colour about half way down the slope of the body whorl, and another in the concavity behind the thickened margin of the anterior end, this latter sometimes extends round to the columella.

Dimensions.—Length, 5 mm.; breadth, 3·25 mm.; length of aperture, 4·25 mm.; breadth of aperture, ·5 mm. The foregoing

are the measurements of the type. We have other examples ranging to length, 6 mm.; breadth, 4 mm.

Locality.—San Remo, Western Port; Otway coast, between Ryan's Den and Moonlight Head, (Mr. P. J. Fulton).

Observations.—Though this shell was first known to Mr. Gatliff from San Remo, we have obtained many additional examples through the kindness of Mr. S. W. Fulton, whose brother collected them at the above mentioned locality. This species has already been referred to under manuscript name in Part III. of our catalogue of Victorian shells. The present species is a larger form than Tate's Erato bimaculata, and also differs from that species in its longer spire, lower shoulder, apertural characters and colour markings. We have an example, probably, representing this species, from St. Vincent's Gulf, South Australia, collected by G. B. Pritchard; but the South Australian shell presents these characters: it is much thinner, narrower, and more translucent, the outer lip is thinner and narrower, and the body whorl shows fine striae of growth; these features, however, are only what might be expected from well grown, but still immature, examples.

Type in Mr. Gatliff's collection.

Turbonilla (Ondina) micra, sp. nov. (Pl. XXI., Fig, 1.)

Shell minute, bulimoid, consisting of an apparently smooth embryo of about a whorl and a half, the axis of enrolment of which makes a slight angle with the axis of enrolment of the shell, succeeded by three to four whorls. The embryo, magnified 70 diameters, shows distinctly pitted spiral grooves.

Whorls only slightly convex, with a fairly impressed suture; the whorls are sculptured by very fine regular spiral lines, but the presence of pitting along these cannot always be detected with an ordinary lens, higher magnification, however, reveals their presence.

Aperture a little longer than a third the length of the shell, of an elongate oval shape, and broadly rounded at the anterior end, where it appears slightly effuse. Columella twisted, inner lip reflected over a slight umbilical chink. Outer lip with a thin sharp edge, but thicker within, and shows a distinct

flattening, or even slight concavity, as it ascends to join the suture. The shell is of a white colour, and none of the specimens hitherto examined show any indication of the presence of any other colour markings.

Dimensions.—Length, 1·5 mm. to about 2 mm.; breadth, ·5 mm to ·75 mm.; length of aperture, about ·75 mm.

Locality.—Off Rhyll, Phillip Island, Western Port, obtained from shell sand dredgings, from about 4 fathoms (Gatliff and Gabriel).

Observations.—Type in Mr. Gatliff's private collection. This little species in many respects recalls Turbonilla casta, A. Adams, being of a somewhat similar habit; but the uniformity of its characters and size, exhibited by a fair series of specimens, preclude the possibility of it being a young representative of that species.

Turbonilla brevis, sp. nov. (Pl. XXI., Fig. 4.)

Shell very small and pupiform, consisting of a smooth heterostrophe embryo of about a whorl and a half with immersed tip, succeeded by four or five whorls very gradually increasing in size.

Spire whorls flattish to slightly convex, but, as the suture is well and at the same time suddenly impressed, the whorls have a somewhat more convex appearance near the suture. Whorls furnished with numerous fine and close costae, approximately about 16 to 20 to a whorl, fine spiral threads are also present showing in the interstices, giving rise to a clathrate ornament. The above sculpture is not always so well marked on the body whorl; this feature in some cases appears to be due to deformity in growth, either from fracture and consequent injury, or other interfering causes against the usual regularity of growth.

Aperture oval, columella straight, outer lip thin, and after ascending descends slightly before joining the penultimate whorl.

Dimensions.—Length, 2 mm.; breadth, ·75 mm.

Locality.—Off Rhyll, Phillip Island, Western Port, from shell sand, dredged from about four fathoms (Gatliff and Gabriel).

Observations.—This well marked and pretty little species appears quite distinct from any described Australian species, but may, perhaps, be compared with Turbonilla scalarina, Brazier,

from Watson's Bay, Sydney. Our shell is, however, apparently of a more robust habit for its size, of fewer whorls, with distinct ornament in the interstices, and judging by Mr. C. Hedley's figure,[1] the costae in ours are more numerous, and run straighter up the shell. These differences seem to amply justify the treatment of our shell as a distinct species, though it might be remarked that the description of the Sydney shell by Mr. Brazier is a very meagre one indeed, and some features noticeable in the figured specimen appear to have had no consideration whatever by him.

Type in Mr. Gatliff's collection.

Odostomia metcalfei, sp. nov. (Pl. XXI., Fig. 3.)

Shell small, biconic, spire longer than the aperture, with a somewhat obtuse apex. Heterostrophe embryo of about a whorl and a half with immersed tip, the extreme obtuse apical portion being so much smaller than the succeeding whorl that a lateral aspect shows a distinct broad tabulation at this part of the shell.

Whorls, three to four, somewhat convex with a distinct suture, and a narrow margin running parallel to and a little below it, a slight inclination to tabulation at the suture. Whorls faintly longitudinally, striate, shell thin, translucent, and of a milky-white colour.

Aperture ovate, slightly effuse anteriorly, furnished on the columellar side at the middle of the aperture with one strong tooth-like plait; outer lip thin.

Dimensions.—Length, 2·5 mm., nearly; breadth, 1·25 mm.; length of aperture, 1 mm.

Locality—Flinders, Western Port (G. B. Pritchard).

Observations.—Mr. Angas, in his list of South Australian shells, published in the "Proceedings of the Zoological Society of London for 1878," gives, on p. 866, the name of Odostomia eburnea, and refers to it as a manuscript name of Metcalfe in the British Museum, and as having been collected by Professor Tate from Holdfast Bay. Our Victorian shell was named for one of us by Professor Tate as O. eburnea; but we have been unable to find any figure or description of that species, and not being

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1 Proc. Linn. Soc. N. S. Wales, 1894, vol. ix., pl. xiv., f. 5.

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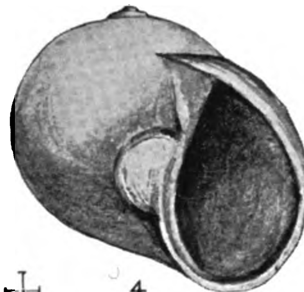

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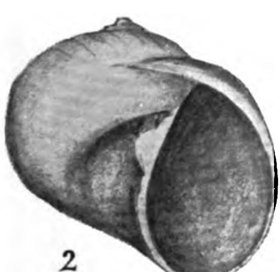

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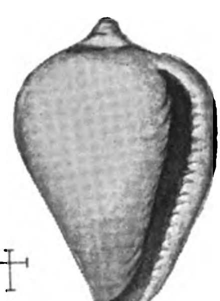

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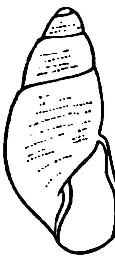

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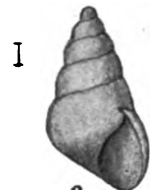

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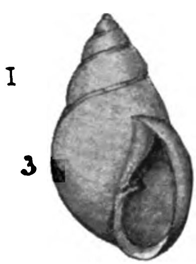

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sure that our shell is necessarily the same as that in the British Museum, we have named it as above.

Type in G. B. Pritchard's private collection.

Stylifer immaculata, sp. nov. (Pl. XXI., Fig. 2.)

Shell small, pyramidal, consisting of about five and a half whorls, with a fairly well marked though small styliform apex.

The apex and spire whorls, with the exception of the penultimate, are of an opaque milky white colour, but the penultimate and body whorls are translucent and hyaline.

The whole shell is perfectly smooth and highly lustrous; the whorls are only very slightly convex, and the suture is not deeply impressed, the body-whorl is subangulate at the periphery and rapidly sloping to the base.

Aperture ovate, slightly effuse anteriorly; inner lip a little thickened, outer lip strong, also a little thickened, but thin at the edge, with a strong forwardly arching margin between the base and the posterior suture, the maximum protrusion being medial, or a little nearer the anterior end.

Dimensions.—Length, 3 mm., nearly; breadth, 1·5 mm.; length of aperture slightly over 1 mm.; breadth of aperture, ·75 mm.

Locality.—Shoreham, Western Port.

Observations.—This species is distinctly an adult form, and though of such small size, all its characters appear well matured, so that the above remarks and accompanying figure should enable it to be easily identified. We are not at present aware of any sufficiently closely related species to necessitate a comparison.

Type in Mr. Gatliff's collection.

Marginella whani, sp. nov. (Pl. XXI., Figs. 5, 6.)

Description.—Shell cylindrical, smooth, fairly solid, spire immersed. Opaque white. Aperture long, narrow, widening anteriorly, continues to the apex of the body whorl. Outer lip thickened, not dentate within; this thickening, which has a distinct porcellanous appearance, continues anteriorly to the columella, a little above the plaits, it also continues well defined over the apex on to the columella, which bears anteriorly three strong and well defined obliquely ascending plaits.

Dimensions.—Length, 11 mm.; breadth, 5 mm.

Locality.—Port Fairy (Rev. T. Whan), Carrum Beach, Port Phillip (Thos. Worcester).

Observations.—Its nearest specific affinity in our waters is M. ovulum, Sowerby; but that species has four plaits, is shorter, and not so cylindrical, and the aperture anteriorly is not so wide. We have pleasure in naming it after the discoverer.

Type in Mr. Gatliff's collection.

DESCRIPTION OF PLATES XX. AND XXI.

PLATE XX.

Fig. 1.—Natica subcostata, T. Wds.
„ 2.—The same.
„ 3.—The same, operculum.
„ 4.—Natica shorehami, n. sp.
„ 5.—Erato denticulata, n. sp.

PLATE XXI.

Fig. 1.—Turbonilla (Ondina) micra, n. sp.
„ 2.—Stylifer immaculata, n. sp.
„ 3.—Odostomia metcalfei, n. sp.
„ 4.—Turbonilla brevis, n. sp.
„ 5.—Marginella whani, n. sp.
„ 6.—The same.

(Note.—All the figures are much enlarged).

Art. VIII.—*Catalogue of the Marine Shells of Victoria.*

Part IV.

By G. B. PRITCHARD and J. H. GATLIFF.

[Read 14th June, 1900.]

The present paper refers to sixty-five species, comprising the following families:—Solariidae, Adeorbidae, Scalidae, Ianthinidae, Trichotropidae, Caecidae, Eulimidae, Pyramidellidae, Turbonillidae, and part of the Cerithiidae.

The previous parts of this Catalogue have appeared as follows:—

Part I., published May, 1898, containing 85 species.
Part II., published February, 1899, containing 59 species.
Part III., published April, 1900, containing 78 species.

The total number of species now indicated as occurring on our shores amounts to 287; but, since the publication of the above parts, some additional material belonging to the genera therein treated has been collected, including a few new species, these will be referred to later in an appendix.

Family Solariidae,

Genus Solarium, Lamarck, 1799.

Solarium luteum, Lamarck.

1839. Solarium luteum, Lamarck. Anim. S. Vert. (edit. Deshayes and Edwards), vol. iii., p. 538.
1841. Solarium luteum, Delessert. Recueil de coquilles décrites par Lamarck, pl. 34, f. 2, *a*, *b*, *c*.
1843. Solarium luteum, Lamarck. Anim. S. Vert. (edit. Deshayes), vol. ix., p. 100.
1863. Solarium (Philippia) luteum, Sowerby. Thes. Conch., vol. iii., p. 237, pl. 253, f. 52-54.
1864. Solarium luteum, Reeve. Conch. Icon., vol. xv., pl. 3, f. 14.

1880. Philippia lutea, Hutton. Man. N.Z. Moll., p. 70.
1887. Solarium (Philippia) luteum, Tryon. Man. Conch., vol. ix., p. 16, pl. 5, f. 71, 72.

Hab.—Western Port; Portland (Maplestone); Port Phillip.

Family ADEORBIDAE.

Genus Adeorbis, S. Wood, 1842.

ADEORBIS VINCENTIANA, Angas.

1880. Adeorbis vincentiana, Angas. P.Z.S. Lond., p. 417., pl. 40, f. 9.
1888. Adeorbis vincentianus, Tryon. Man. Conch., vol. x., p. 86, pl. 30, f. 100.

Hab.—Flinders, San Remo.

ADEORBIS, n. sp.

Hab.—Sorrento (G.B.P.).

Obs.—This species, as far as we have hitherto been able to examine it, appears new.

Note.—With regard to the position of Adeorbis, Woodward refers it to the Turbinidae, whereas Fischer and others refer to it as typifying a separate group of family value, namely, Adeorbidae, at the same time removing it from the neighbourhood of Turbinidae or Trochidae, and placing it near Ianthinidae and Scalaridae. Tryon, again, includes Adeorbis in the family Solariidae, and Professor Tate includes it in the Cyclostremidae, while Adcock, in his "Hand List of the Aquatic Mollusca of South Australia," refers to Adeorbidae as a separate family in the neighbourhood of Cyclostremidae and Turbinidae.

In view of these conflicting opinions, it is a somewhat difficult matter to know what to do, especially as we have not had any opportunity as yet of examining living specimens, we, therefore, find it most convenient at present to follow Fischer.

Family IANTHINIDAE.

Genus Ianthina, Bolton, 1798.

IANTHINA EXIGUA, Lamarck.

1839. Janthina exigua, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 505.

1843. Ianthina exigua, Lamarck. Anim. S. Vert., vol. ix., p. 5.

1858. Ianthina exigua, Reeve. Conch. Icon., vol. xi., pl. 5, f. 21, *a*, *b*.

1882. Ianthina exigua, Sowerby. Thes. Conch., vol. v., p. 51, pl. 444, f. 23, 24.

1887. Ianthina exigua, Tryon. Man. Conch., vol. ix., p. 37, pl. 10, f. 17.

Hab.—Curdie's Inlet.

IANTHINA STRIOLATA, Adams and Reeve.

1848. Ianthina striolata, Adams and Reeve. Samarang, p. 54, pl. 11, f. 9.

1858. Ianthina striolata, Reeve. Conch. Icon., vol. xi., pl. 5, f. 24, *a*, *b*.

1882. Ianthina striolata, Sowerby. Thes. Conch., vol. v., p. 51, pl. 444, f. 19.

1887. Ianthina striolata, Tryon. Man. Conch., vol. ix., p. 37, pl. 10, f. 16.

Hab.—Portland (Maplestone).

Obs.—Tryon's treatment of this species is particularly confusing, on account of the great number of synonyms recognised by him, some of which we do not agree with, and the remainder we are unable to verify.

IANTHINA BALTEATA, Reeve.

1858. Ianthina balteata, Reeve. Conch. Icon., vol. xi., pl. 3, f. 11, *a*, *b*.

1882. Ianthina balteata, Sowerby. Thes. Conch., vol. v., p. 50, pl. 443, f. 12.

1887. Ianthina balteata, Tryon. Man. Conch., vol. ix., p. 36, pl. 9, f. 98.

Hab.—Portland (Maplestone).

Obs.—The remarks made upon the preceding species will apply here also.

IANTHINA COMMUNIS, Lamarck.

1839. Janthina communis, Lamarck. Anim. S. Vert., (3rd ed., Deshayes and Edwards), vol. iii., p. 504.

1843. Janthina communis, Lamarck. Anim. S. Vert., vol. ix., p. 4.

1858. Janthina communis, Reeve. Conch. Icon., vol. xi., pl. 1, f. 5*a*, 5*b*.

1880. Ianthina communis, Hutton. Man. N.Z. Moll., p. 71.

1882. Ianthina communis, Sowerby. Thes. Conch., vol. v., p. 50, pl. 443, f. 7.

1883. Ianthina communis, Tryon. Syst. and Struct. Conch., vol. ii., p. 222, pl. 67, f. 49.

1887. Ianthina communis, Tryon. Man. Conch., vol. ix., p. 36, pl. 9, f. 99.

Hab.—Gabo Island (E. O. Thiele).

Obs.—Tryon considers this to be conspecific with I. fragilis, Lamarck; but both Reeve and Sowerby distinctly state that it differs from that species—with which opinion we agree.

Family Trichotropidae.

Genus Trichotropis, Broderip and Sowerby, 1829.

Trichotropis gabrieli, Pritchard and Gatliff.

1889. Trichotropis gabrieli, Pritchard and Gatliff. P.R.S. Vic., p. 183, pl. 20, f. 7.

Hab.—Swan Bay Channel, off Phillip Island, Western Port. Dredged in about 4 fathoms (J. Gabriel).

Obs.—The type of this species is in Mr. Gatliff's private collection.

Family Scalidae.

Genus Scala, Klein, 1753.

Scala australis, Lamarck.

1839. Scalaria australis, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 529.

1841. Scalaria australis, Delessert. Recueil de coquilles décrites par Lamarck, pl. 33, f. 11.

1843. Scalaria australis, Lamarck. Anim. S. Vert., vol. ix., p. 76.

1844. Scalaria australis, Sowerby. Thes. Conch., vol. i., p. 103, pl. 35, f. 135.

1874. Scalaria australis, Reeve. Conch. Icon., vol. xix., pl. 1, f. 3.

1887. Scalaria (Opalia) australis, Tryon. Man. Conch., vol. ix., p. 76, pl. 16, f. 90.

Hab.—Portland; Port Fairy; Warrnambool; Cape Otway; Lorne; Puebla Coast; Port Phillip; Western Port; Anderson's Inlet.

SCALA GRANOSA, Quoy and Gaimard.

1834. Turritella granosa, Quoy and Gaimard. Astrolabe, vol. iii., p. 138, pl. 55, f. 29, 30.

1844. Scalaria granulosa, Sowerby. Thes. Conch., vol. i., p. 104, pl. 35, f. 144.

1873. Scalaria granulata, Reeve. Conch. Icon., vol. xix., pl. 5, f. 35.

1887. Scalaria (Acirsa) granulosa, Tryon. Man. Conch., vol. ix., p. 80, pl. 16, f. 11.

Hab.—Same as preceding species, but rather less abundant.

SCALA JUKESIANA, Forbes.

1852. Scalaria jukesiana, Forbes. Appendix Voyage of the Rattlesnake, vol. ii., p. 383, pl. 3, f. 7.

1864. Scalaria delicatula, Crosse and Fischer. Jour. d. Conch., vol. iv., ser. 3, p. 347.

1864. Scalaria consors, Crosse and Fischer. *Id.*

1865. Scalaria delicatula, Crosse and Fischer. *Id.*, p. 42, pl. 3, f. 9, 10.

1865. Scalaria consors, Crosse and Fischer. *Id.*, p. 43, pl. iii., f. 11, 12.

1873. Scalaria jukesiana, Reeve. Conch. Icon., vol. xix., pl. 11, f. 80.

1874. Scalaria delicatula, Reeve. *Id.*, pl. 15, f. 115.

1887. Scalaria (Clathrus) jukesiana, Tryon. Man. Conch., vol. ix., p. 66, pl. 14, f. 20.

1887. Scalaria (Clathrus) delicatula, Tryon. *Id.*, p. 69, pl. 14, f. 39.

Hab.—Port Phillip; Western Port; Portland (Maplestone); Barwon Heads; Puebla Coast.

Obs.—There is little doubt but that the species included above are synonymous, especially when we find an even greater

amount of individual variation allowed in other species of this genus.

Scala philippinarum, Sowerby.

1844. Scalaria philippinarum, Sowerby. P.Z.S. Lond., p. 12.

1844. Scalaria philippinarum, Sowerby. Thes. Conch., vol. i., p. 86, pl. 32, f. 1-3.

1873. Scalaria philippinarum, Reeve. Conch. Icon., vol. xix., pl. 4, f. 21.

1887. Scalaria (Clathrus) philippinarum, Tryon. Man. Conch., vol. ix., p. 66, pl. 13, f. 18, 19.

Hab.—Western Port; Port Phillip; Airey's Inlet; Puebla Coast.

Genus **Crossea**, A. Adams, 1865.

Crossea concinna, Angas.

1867. Crossea concinna, Angas. P.Z.S. Lond., p. 911, pl. 44, f. 14.

1887. Scalaria (Crosseia) concinna, Tryon. Man. Conch., vol. ix., p. 85, pl. 17, f. 45.

Hab.—Western Port; Sorrento; Altona Bay (F. E. Grant).

Family Caecidae.

Genus **Caecum**, Fleming, 1817.

Caecum, sp.

Hab.—Port Albert (T. Worcester).

Obs.—We have not yet determined as to whether the species before us has been described, but think it probable that it is a new one, and most likely will come under the sub-genus Meioceras, Carpenter.

Family Eulimidae.

Genus **Eulima**, Risso, 1826.

Eulima augur, Angas.

1865. Eulima augur, Angas. P.Z.S. Lond., p. 56.

1866. Eulima augur, Reeve. Conch. Icon., vol. xv., pl. 6, f. 47, *a*, *b*.

1866. Eulima proxima, Sowerby, Reeve. *Id.*, f. 48.

1886. Eulima augur, Tryon. Man. Conch., vol. viii., p. 269, pl. 68, f. 10.

1886. Eulima proxima, Tryon. *Id.*, f. 11.

1898. Eulima augur, Tate. T.R.S. S.A., vol. xxii., pt. 1, p. 80.

Hab.—Western Port; Port Phillip.

Obs.—Professor Tate, in the reference above given, states that he has compared the types at the British Museum of E. augur and E. proxima; he considers them one species. We, therefore, cite the shell as above. The type of E. augur was obtained from South Australia by Angas, and the type of E. proxima was got in Port Jackson.

EULIMA TENISONI, Tryon.

1875. Eulima micans, T. Woods (non Carpenter). P.R.S. Tas., p. 144.

1886. Eulima tenisoni, Tryon. Man. Conch., vol. viii., p. 269, pl. 68, f. 16.

1898. Eulima tenisoni, Tate. T.R.S. S.A., vol. xxii., pt. 1, p. 81.

Hab.—Western Port.

EULIMA MARGINATA, T. Woods.

1878. Eulima marginata, T. Woods. P.R.S. Tas., p. 40.

1886. Eulima marginata, Tryon. Man. Conch., vol. viii., p. 278.

Hab.—Flinders, Western Port.

EULIMA INDISCRETA, Tate.

1898. Eulima indiscreta, Tate. T.R.S. S.A., vol. xxii., pt. i., p. 82, pl. 4, f. 3.

Hab.—Flinders, Western Port.

EULIMA COMMENSALIS, Tate.

1898. Eulima commensalis, Tate. T.R.S. S.A., vol. xxii., pt. i., p. 82, pl. 4, f. 2.

Hab.—Flinders, Western Port.

EULIMA MUCRONATA, Sowerby.

1866. Eulima mucronata, Sowerby. Conch. Icon., vol. xv., pl. 6, f. 42.

1886. Eulima (Mucronalia) mucronata, Tryon. Man. Conch., vol. viii., p. 284, pl. 70, f. 5.

Hab.—Western Port; Port Phillip; Puebla Coast.

EULIMA COXI, Pilsbry.

1899. Eulima (Hypermastus) coxi, Pilsbry. Proc. Acad. Nat. Sci. Philad., p. 258, pl. 11, f. 3, 4.

Hab.—Shoreham, Western Port.

NOTE.—We have three other specimens of Eulima, which may prove to be undescribed, but two are very minute and possibly young shells, the other has lost its apex, so we refrain from describing them until we obtain more specimens.

Genus Leiostraca, H. and A. Adams, 1853.

LEIOSTRACA ACUTISSIMA, Sowerby.

1866. Leiostraca acutissima, Sowerby. Conch. Icon., vol. xv., pl. 2, f. 10.

1886. Eulima (Subularia) acutissima, Tryon. Man. Conch., vol. viii., p. 281, pl. 70, f. 89.

Hab.—Western Port; Port Phillip.

Genus Stylifer, Broderip, 1832.

STYLIFER CROTAPHIS, Watson.

1886. Stylifer crotaphis, Watson. Chall. Zool., vol. xv., p. 525, pl. 37, f. 10.

Hab.—Off East Moncoeur Island, Bass Strait, 38 to 40 fathoms sand and shells (Challenger).

STYLIFER IMMACULATA, Pritchard and Gatliff.

1900. Stylifer immaculata, Pritchard and Gatliff. P.R.S. Vic., vol. xiii, pt. i., n.s., p. 137, pl. 21, f. 2.

Hab.—Shoreham, Western Port.

STYLIFER ROBUSTA, Petterd.

1884. Stylifer robusta, Petterd. Jour. of Conch., p. 140, No. 22.

1886. Stylifer robustus, Tryon. Man. Conch., vol. viii., p. 293.

Hab.—Western Port.

STYLIFER LODDERAE, Petterd.

1984. Stylifer lodderae, Petterd. Jour. of Conch., p. 140, sp. No. 23.

1886. Stylifer lodderae, Tryon. Man. Conch., vol. viii., p. 293.

Hab.—Flinders, Western Port; Port Phillip.

STYLIFER BRUNNEUS, Tate.

1888. Stylifer brunneus, Tate. T.R.S. S.A., p. 65, pl. II, f. 9.

Hab.—Parasitic on Strongylocentrotus, invariably on the periproct, in eight to ten fathoms, Capel Sound, Port Phillip Heads (J. B. Wilson). Dredged off Rhyll, Phillip Island, Western Port, in about 6 fathoms (Gatliff and C. J. Gabriel).

Family PYRAMIDELLIDAE.

Genus **Pyramidella**, Lamarck, 1799.

PYRAMIDELLA BIFASCIATA, T. Woods.

1875. Syrnola bifasciata, T. Woods. P.R.S. Tas., p. 145.

1877. Obeliscus jucundus, Angas. P.Z.S. Lond., p. 173, pl. 24, f. 10.

1886. Pyramidella (Lonchaeus) jucunda, Tryon. Man. Conch., vol. viii., p. 303, pl. 73, f. 92.

1886. Pyramidella bifasciata, Tryon. *Id.*, p. 309.

Hab.—Western Port; Port Phillip.

PYRAMIDELLA TINCTA, Angas.

1871. Syrnola tincta, Angas. P.Z.S. Lond., p. 15, pl. 1, f. 11.

1884. Eulima aurantia, Petterd. Jour. of Conch., p. 144.

1886. Pyramidella (Syrnola) tincta, Tryon. Man. Conch., vol. viii., p. 308, pl. 73, f. 24.

Hab.—Western Port; Port Phillip; Barwon Heads.

PYRAMIDELLA JONESIANA, Tate.

1898. Odontostomia (Syrnola) jonesiana, Tate. T.R.S. S.A., p. 70 and p. 82, where it is figured.

Hab.—Flinders, Western Port.

Family TURBONILLIDAE.

Genus **Turbonilla,** Risso, 1826.

TURBONILLA (ONDINA) MICRA, Pritchard and Gatliff.

1900. Turbonilla (Ondina) micra, Pritchard and Gatliff. P.R.S. Vic., vol. xiii., pt. 1, n.s., p. 134. pl. 21, f. 1.

Hab.—Dredged off Rhyll, Western Port; shell sand dredgings from 4 fathoms (Gatliff and Gabriel).

TURBONILLA (ONDINA) CASTA, A. Adams.

1851. Monoptygma casta, A. Adams. P.Z.S. Lond., p. 223.

1854. Monoptygma casta, Sowerby. Thes. Conch., vol. ii., p. 818, pl. 172, f. 22.

1878. Rissoa (Ceratia) punctato-striata, T. Woods. P.R.S. Tas., p. 35.

1886. Odostomia (Parthenia) casta, Watson. Chall. Zool., vol. xv., p. 487, No. 14, and p. 704.

1886. Odostomia (Parthenia) casta, Tryon. Man. Conch., vol. viii., p. 365 (in his list of unfigured species).

1886. Pyramidella (Actaeopyramis) casta, Tryon. *Id.*, p. 314, pl. 74, f. 45.

1899. Adelactaeon concinna casta, Tate. T.R.S. S.A., p. 236.

Hab.—Dredged, 38-40 fathoms, sand and shells; off East Moncoeur Island, Bass' Strait (Challenger); Hobson's Bay; Altona Bay (F. E. Grant); Port Phillip; Western Port.

Obs.—The type was obtained by A. Adams in the China seas; he also described a species from Moreton Bay as Monoptygma concinna, a very similar shell, and by many considered to be the same, but mentions it as having the outer lip lirate internally; this character does not occur in any of the specimens that we have obtained. Watson states that the types of M. casta, A. Adams, and M. concinna, A. Adams, are both in the British Museum, and are identical. We follow W. H. Dall in his paper on the Tertiary Molluscs of Florida, Part II., Transactions of the Wagner Institute, in classifying the two foregoing species.

TURBONILLA MARIAE, T. Woods.

1867. Turbonilla nitida, Angus (non A. Adams). P.Z.S. Lond., p. 112, pl. 13, f. 9.

1875. Turbonilla mariae, T. Woods. P.R.S. Tas., p. 144.

1876. Turbonilla macleayana, T. Woods. *Id.*, p. 151.

1877. Turbonilla hofmani, Angas. P.Z.S. Lond., p. 183.

1877. Turbonilla angasi, T. Woods. P.R.S. Tas., p. 34.

1886. Turbonilla hofmani, Tryon. Man. Conch., vol. viii., p. 334, pl. 76, f. 41, 42.

1886. Turbonilla macleayana, Tryon. *Id.*, f. 44.

Hab.—Port Phillip; Western Port; Barwon Heads; Puebla Coast; Anderson's Inlet.

Obs.—After his description of T. macleayana, T. Woods remarks, "It appears to me, however, in shells of such uniform character as *Turbonilla*, that we are often dealing with varieties instead of species, and the above may be a case in point." We consider the slight variation in this species insufficient to warrant separate designation, and, therefore, cite it as above.

TURBONILLA FUSCA, A. Adams.

1853. Chemnitzia fusca, A. Adams. P.Z.S. Lond., p. 181.

1877. Elusa bifasciata, T. Woods. P.R.S. Tas., p. 150.

1877. Turbonilla festiva, Angas (*non* Folin). P.Z.S. Lond., p. 35, pl. 5, f. 4.

1879. Turbonilla erubescens, Tate. T.R.S. S.A., p. 138, pl. 5, f. 10.

1886. Turbonilla festiva, Tryon. Man. Conch., vol. viii., p. 334, pl. 76, f. 45.

1886. Turbonilla fusca, Tryon. *Id.*, f. 46, 47.

1898. Turbonilla erubescens, Tate. T.R.S. S.A., p. 84.

Hab.—Flinders, Western Port; Port Phillip.

Obs.—This shell is sometimes wholly coloured reddish-brown, other specimens are of light colour, encircled by two narrow dark bands on the body whorl, one on the other whorls. In length it ranges from 4 to 6 mm.

TURBONILLA TASMANICA, T. Woods.

1875. Turbonilla tasmanica, T. Woods. P.R.S. Tas., p. 145.

1884. Chemnitzia beddomei, Petterd. Jour. of Conch., p. 136.

1886. Turbonilla tasmanica, Tryon. Man. Conch., vol. viii., p. 335, pl. 76, f. 40.

1892. Turbonilla crenulifera, Tate. T.R.S. S.A., p. 126, pl. 1, f. 2.

1898. Turbonilla beddomei, Tate. *Id.*, p. 85.

Hab.—Western Port.

Obs.—T. Woods described a shell larger than those subsequently named; they are 5 mm. in length, his are 7 mm.; it varies in breadth. Tryon's figure is too acute in form, Tate's is better, but appears to be somewhat more closely ribbed than our representative of the species.

TURBONILLA SPINA, Crosse and Fischer.

1864. Turritella spina, Crosse and Fischer. Jour. de Conch., vol. xii., p. 347.

1865. Turritella spina, Crosse and Fischer. *Id.*, vol. xiii., p. 44, pl. 3, f. 13, 14.

1865. Cingulina spina, Angas. P.Z.S. Lond., p. 169, No. 84.

1876. Aclis tristriata, T. Woods. P.R.S. Tas., p. 22, No. 52.

1886. Mathilda (Cingulina) spina, Watson. Chall. Zool., vol. xv., p. 499.

1886. Turbonilla (Cingulina) spina, Tryon. Man. Conch., vol. viii., p. 338, pl. 76, f. 52.

Hab.—Port Phillip; Western Port.

Obs.—We have to thank Mr. C. Hedley, of the Australian Museum, Sydney, for calling our attention to the fact of the above species having been wrongfully identified in Adcock's Hand List of the Aquatic Mollusca of South Australia as Mathilda (Cingulina) circinata, Adams. This is a Japanese shell of similar habit but the base is lirate, a feature which is absent in our species.

TURBONILLA BREVIS, Pritchard and Gatliff.

1900. Turbonilla brevis, Pritchard and Gatliff. P.R.S. Vic., vol. xiii., p. 1, n.s., p. 135, pl. 21, f. 4.

Hab.—Off Rhyll, Phillip Island; Western Port; obtained from shell sand from about 4 fathoms (Gatliff and Gabriel).

Obs.—The type of this species is in Mr. J. H. Gatliff's private collection.

Genus Eulimella, Forbes, 1846.

EULIMELLA MONILIFORME, Hedley and Musson.

1891. Eulimella moniliforme, Hedley and Musson. P.L.S. N.S.W., p. 247, pl. 19, f. 1-3.

1898. Eulimella moniliformis, Tate. T.R.S. S.A., p. 82.

Hab.—Port Fairy (Rev. W. T. Whan).

Genus Odostomia, Fleming, 1828.

ODOSTOMIA PETTERDI, Gatliff.

1884. Obeliscus tasmanica, Petterd (non T. Woods). Jour. of Conch., p. 140.

1886. Pyramidella tasmanica, Tryon. Man. Conch., vol. viii., p. 303.

1900. Odostomia petterdi, Gatliff. V.N., vol. xvii, No 3, p. 54.

Hab.—Western Port.

Obs.—This species is very nearly related to O. laevis, Angas but is not so solid, is flatter in the whorls, and more elongate.

ODOSTOMIA ANGASI, Tryon.

1867. Odostomia lactea, Angas (non Dunker). P.Z.S. Lond., p. 112.

1886. Odostomia angasi, Tryon. Man. Conch., vol. viii., p. 362, pl. 79, f. 68.

Hab.—Western Port.

ODOSTOMIA AUSTRALIS, Angus.

1871. Agatha australis, Angus. P.Z.S. Lond., p. 15, pl. 1, f. 9.

1886. Pyramidella (Agatha) australis, Tryon. Man. Conch., vol. viii., p. 309, pl. 74, f. 27.

Hab.—Port Phillip; Western Port.

ODOSTOMIA METCALFEI, Pritchard and Gatliff.

1900. Odostomia metcalfei, Pritchard and Gatliff. P.R.S. Vic., vol. xiii., pt. 1, n.s., p. 136, pl. 21, f. 3.

Hab.—Flinders, Western Port (G. B. Pritchard).

Obs.—Reference to the notes already made on this species may be made to the previous paper containing its description. The type is in G. B. Pritchard's private collection.

NOTE.—We have six additional species of Odostomia from Western Port, as yet unidentified, and as we have been informed that Professor Tate and Mr. May will shortly issue a comprehensive paper on the Tasmanian marine shells, we wish to see if they treat of any of these forms before we go any further with them.

Family CERITHIIDAE.

Genus Cerithium, Adanson, 1757.

CERITHIUM MONACHUS, Crosse and Fischer.

1855. Cerithium dubium, Sowerby. Thes. Conch., vol., ii., p. 864, pl. 181, f. 120 (non C. dubium, Sowerby. Min. Conch., 1816).

1864. Cerithium monachus, Crosse and Fischer. Jour. de Conch., p. 347, *Id.*, 1865, p. 45, pl. 3, f. 17, 18.

1865. Cerithium dubium, Reeve. Conch. Icon., vol. xv., pl. 12, f. 78.

1880. Cerithium eludens, Bayle. Jour. de Conch., p. 245.

1886. Cerithium dubium, Watson. Chall., vol. xv., p. 502.

1887. Cerithium eludens, Tryon. Man. Conch., vol. ix., p. 136, pl. 25, f. 63.

1887. Cerithium (Liocerithium) monachus, Tryon. *Id.*, p. 143, pl. 27, f. 21.

Hab.—Port Phillip; Western Port; Portland; Cape Otway Coast; Port Albert.

Obs.—Sowerby's shells were obtained from Van Diemen's Land. Crosse and Fischer re-described it in 1864 from South Australian specimens obtained by Mr. Angas. Bayle apparently overlooked the latter description, and re-named it as C. eludens

to replace Sowerby's specific name, as it was already preoccupied by a fossil species in Sowerby's Mineral Conchology of 1816.

Genus **Ataxocerithium**, Tate, 1893.

ATAXOCERITHIUM SEROTINUM, A. Adams.

1855. Cerithium serotina, A. Adams. Thes. Conch., vol. ii., p. 861, pl. 180, f. 102.
1855. Cerithium rhodostoma, A. Adams. *Id.*, f. 103.
1865. Cerithium rhodostoma, Reeve. Conch. Icon., vol. xv., pl. 20, f. 143.
1865. Cerithium serotinum, Reeve. *Id.*, f. 146.
1887. Cerithium serotinum, Tryon. Man. Conch., vol. ix., p. 141, pl. 27, f. 19, 20.
1893. Ataxocerithium serotinum, Tate. J.R.S. N.S.W., p. 179.
1897. Ataxocerithium serotinum, Tate. T.R.S. S.A., p. 42.

Hab.—Port Phillip; Western Port.

Genus **Bittium**, Gray, 1847.

BITTIUM GRANARIUM, Kiener.

Cerithium granarium, Kiener. Icon. Coq. Viv., p. 72, pl. 19, f. 3.
1843. Cerithium granarium, Menke. Moll. Nov. Holl., p. 20, No. 84.
1855. Cerithium granarium, Sowerby. Thes. Conch., vol. ii., p. 879, pl. 184, f. 225-227.
1865. Cerithium granarium, Reeve. Conch. Icon., vol. xv., pl. 19, f. 135.
1886. Bittium granarium, Watson. Chall., vol. xv., p. 539.
1887. Bittium granarium, Tryon. Man. Conch., vol. ix., p. 155, pl. 30, f. 98.

Hab.—Coast generally; alive on weedy sand banks.

BITTIUM CERITHIUM, Quoy and Gaimard.

1834. Turritella cerithium, Quoy and Gaimard. Astrolabe, vol. iii., p. 139, pl. 55, f. 27, 28.
1855. Cerithium turritella, Sowerby (non Quoy and Gaimard). Thes. Conch., vol. ii., p. 882, pl. 185, f. 255, 256.

1887. Potamides (Cerithidea) turritella, Tryon (non Quoy and Gaimard). Man. Conch., vol. ix., p. 163, pl. 34, f. 93, 94.

1897. Batillaria cerithium, Tate. T.R.S. S.A., p. 42.

Hab.—The same as the preceding species.

Obs.—We have reasons for believing that the shell of the male is very much smaller than that of the female, and investigations of the molluscs may result in a reduction of the number of specific names.

BITTIUM LAWLEYANUM, Crosse.

1863. Bittium lawleyanum, Crosse. Jour. de Conch., p. 87, pl. 1, f. 4.

1887. Bittium lawleyanum, Tryon. Man. Conch., vol. ix., p. 154, pl. 30, f. 5.

Hab.—Same as preceding.

BITTIUM INSCULPTUM, Sowerby.

1865. Cerithium insculptum, Sowerby. In Reeve's Conch. Icon., vol. xv., pl. 18, f. 128.

1866. Cerithium insculptum, Sowerby. Thes. Conch., vol. iii., pl. 290, f. 332.

Hab.—Same as preceding.

Obs.—Tryon unites this with B. lawleyanum, but we are unable to agree with him.

BITTIUM ESTUARINUM, Tate.

Bittium pyramidale, Tate, m.s.

1878. Bittium estuarinum, Tate. T.R.S. S.A., p. 190, pl. 1, f. 12.

Hab.—Same as preceding.

Obs.—We think an extended series of specimens may result, in uniting this with B. insculptum.

BITTIUM ICARUS, Bayle.

1855. Cerithium tenue, Sowerby (non. Deshayes). Thes. Conch., vol. ii., p. 876, pl. 184, f. 212 (on the plate in error numbered 202).

1865. Cerithium tenue, Reeve. Conch. Icon., vol. xv., pl. 18, f. 130.

1880. Cerithium icarus, Bayle. Jour. de Conch., p. 249.
1887. Cerithium icarus, Tryon. Man. Conch., vol. ix., p. 138, pl. 26, f. 83, 84.
1894. Bittium variegatum, Brazier. P.L.S. N.S.W., p. 172, pl. 14, f. 9.

Hab.—Flinders, San Remo, Western Port; Portsea, Port Phillip.

BITTIUM MINIMUM, T. Woods.

1879. Bittium minimum, T. Woods. P.R.S. Tas., p. 35.

Hab.—Same as preceding.

Genus **Cerithiopsis**, Forbes and Hanley, 1853.

CERITHIOPSIS CROCEA, Angas.

1871. Cerithiopsis crocea, Angas. P.Z.S. Lond., p. 16, pl. 1, f. 13.
1877. Cerithiopsis purpurea, Angas. *Id.*, p. 36, pl. 5, f. 7.
1875. Cerithiopsis atkinsoni, T. Woods. P.R.S. Tas., p. 139.
1876. Cerithiopsis albosutura, T. Woods. *Id.*, p. 140.
1887. Cerithiopsis (Seila) crocea, Tryon. Man. Conch., vol. ix., p. 175, pl. 36, f. 66.
1887. Cerithiopsis (Seila) crocea, var. purpurea, Tryon. *Id.*, f. 67.

Hab.—Port Phillip; Western Port.

Obs.—The type was described as having 14 whorls; length, 10 mm. We have before us a decollated specimen that must have attained to a very large size, as there are only 8 whorls remaining, and its present length is 17 mm.

CERITHIOPSIS, sp.

Hab.—Hobson's Bay, Port Phillip.

Obs.—We have only one specimen; it is of distinct character, but the outer lip is slightly imperfect, and we desire to obtain other specimens before describing and figuring it.

CERITHIOPSIS ANGASI, O. Semper.

1871. Cerithiopsis clathratus, Angas (non Menke). P.Z.S. Lond., p. 61, pl. 1, f. 12.

1874. Cerithiopsis angasi, O. Semper. Catalogue v., Museum Godeffroy, p. 108, No. 6882.
1879. Bittium turbonilloides, T. Woods. P.R.S. Tas., p. 39.
1887. Cerithiopsis angasi, Tryon. Man. Conch., vol. ix., p. 172, pl. 36, f. 49.

Hab.—Western Port.

Genus **Potamides**, Brongniart, 1810.

POTAMIDES EBENINUS, Bruguiere.

Potamides ebeneum, Bruguiere. Encycl. Meth., pl. 442, f. 1, *a*, *b*.
Potamides ebeninus, Bruguiere. Dict. No. 26.
1834. Cerithium ebeninum, Quoy and Gaimard. Astrolabe, vol. iii., p 123, pl. 55, f. 1-3.
1855. Cerithium ebeninum, Sowerby. Thes. Conch., vol. ii., p. 885, pl. 185, f. 267.
1866. Potamides ebeninus, Reeve. Conch. Icon., vol. xv., pl. 1, f. 2, *a*, *b*.
1887. Potamides ebeninus, Tryon. Man. Conch., vol. ix., p. 138, pl. 31, f. 31.

Hab.—Malacoota Inlet (Worcester).

POTAMIDES AUSTRALIS, Quoy and Gaimard.

1834. Cerithium australe, Quoy and Gaimard. Astrolabe, vol. iii., p. 131, pl. 55, f. 7.
1855. Cerithium australe, Sowerby. Thes. Conch., vol. ii., p. 884, pl. 185, f. 266.
1866. Lampania australis, Reeve. Conch. Icon., vol. xv., pl. 1, f. 4, *b*.
1886. Potamides (Lampania) australis, Tryon. Man. Conch., vol. ix., p. 166, pl. 34, f. 99, 100.
1886. Cerithium (Lampania) australe, Watson. Chall., vol. xv., p. 536.

Hab.—Port Phillip; Western Port.

Art. IX.—*On the Nomenclature of Geological Age.*

By G. B. PRITCHARD,

Lecturer in Geology, etc., at the Working Men's College; Acting Lecturer in Geology, Mineralogy, and Metallurgy at the Melbourne University.

[Read before Section C of the Australasian Association for the Advancement of Science, 12th January, 1900.]

As a teacher of geology I find one aspect of the subject which is continually causing difficulties and confusion to the students, is the very loose and indefinite use of the terms indicating geological age. In the present paper I hope to be able to point out a few of the inconsistencies and contradictions that have come under my notice in the course of my work, and to show the very peculiar state we have arrived at with regard to our Time Scale for the Australian Colonies.

Although many of us have been taught to recognise a general table of Geological Divisions of the Time Scale as of general use and world-wide application, we soon find that such is really not the case, and as Professor Scott has rightly remarked,[1] "The method of making the divisions and subdivisions of geological time is not yet a fixed one, and there is much difference in the usage of various writers." In the first place it seems sufficient to recognise the three divisions—Palaeozoic, Mesozoic, and Cainozoic, of the Geological Record, or as an alternative—Primary, Secondary, and Tertiary, but even this is not consistently adhered to, for we find the term of Tertiary much more frequently used than the term Cainozoic and associated with the terms Palaeozoic and Mesozoic. We find some authorities recognising five main divisions of the Geological Record,[2] that is in addition to the above, the oldest division has been variously referred to as Pre-Cambrian, Archaean, Azoic, Eozoic, or Proterozoic, and the youngest as Post-Tertiary or Quarternary. Is there any necessity

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1 An Introduction to Geology, by Professor W. B. Scott, p. 354.

2 Text Book of Geology, by Archibald Geikie, 3rd ed., p. 680.

for these additions? For my own part I think not. From an Australian point of view we find Professor Tate in his inaugural address to this Association in 1893[1] remarking, "Thus in Australia, as in other Continental areas, there are developments of Azoic, Palaeozoic, Mesozoic, and Cainozoic rocks; and, moreover, the geological sequence of the chief marine formations are fairly well represented—from Archaean to Permo-Carboniferous, from Trias to Cretaceous, and from Eocene to those deposits now in process of accumulation."

The same author also states,[2] "It is only in South Australia and West Australia that the metamorphic rocks are actually known to be Pre-Cambrian, but those elsewhere, unless they can be shown to be transmuted Palaeozoic rocks, may be most conveniently referred to the same period. The grandest exemplification of the Archaeans is in the Mount Lofty Range of South Australia." Further investigation has changed the face of this question, for Mr. W. Howchin, F.G.S., in a paper contributed to the Royal Society of South Australia in 1897,[3] states—"Discoveries have been recently made, however, in these so-called Archaean rocks which have an important bearing on this subject, and on the most convincing evidence determines the basal beds of the Mount Lofty Ranges to be in part, if not wholly, of Lower Cambrian Age."

If the above reasoning of Professor Tate holds at all, it surely means that we have at present only extremely slight foundation, and that perhaps somewhat doubtful, for the use or retention of the term Pre-Cambrian, let alone Archaean, etc.

Even if the retention of the term Pre-Cambrian is found in any way convenient, it certainly seems most suitable to regard it as subsidiary to Palaeozoic and not to rank as an equivalent division. Such palaeontological evidence as has hitherto been forthcoming from rocks regarded as Pre-Cambrian outside Australia does not appear in any way to warrant the separation from the Palaeozoic.

Then with regard to Post-Tertiary or Quarternary, these terms are surely superfluous, for all the evidence we have clearly

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1 A.A.A.S., Adelaide, 1893, p. 30.
2 *Loc. cit.*, p. 47.
3 Trans. Roy. Soc. S.A., 1897, p. 74.

indicates that we are still within the Tertiary Era, and it is difficult to see the necessity for the introduction of these additions.

We may now make reference to a Table of the Geological Record of the succession of strata as follows :—

TABLE I.

Cainozoic or Tertiary	Recent. Pleistocene. Pliocene. Miocene. Eocene.
Mesozoic or Secondary	Cretaceous. Jurassic. Triassic.
Palaeozoic or Primary	Permian. Carboniferous. Devonian. Silurian. Ordovician. Cambrian. Pre-Cambrian.

Now how far does adherence to such a Table go. Geikie remarks[1]—" By common consent it is admitted that names taken from the region where a formation or group of rocks is typically developed, are best adapted for general use. Cambrian, Silurian, Devonian, Permian, Jurassic, are of this class, and have been adopted all over the globe."

We find, however, quite a number of additional terms which do not always mean what one would expect from the composition of the term, hence there are different interpretations by various authors, and as a consequence considerable confusion. In the Cainozoic or Tertiary there is not as a rule much confusion. The introduction and use of Oligocene for certain Victorian deposits without proper explanation of the evidence for its use has had peculiar results, for notice the interpretation of our geology even by such a master as Sir Archibald Geikie.[2] The use of this term has also led the officers of the Geological Survey of Victoria into errors which might otherwise have been avoided, for it has been shown on indisputable stratigraphical and palaeontological

1 Text Book of Geology, 3rd ed., p. 679.
2 *Loc. cit.*, pp. 982, 983, compare with p. 1008.

evidence[1] that their so-called Oligocene actually overlies their so-called Miocene. Further confirmatory evidence of this fact has since been brought forward.

The aspect taken by the present head, Mr. James Stirling, of the Geological Department of Victoria, may be best shown by quoting his remarks,[2] "I cannot help concurring with my friend Mr. R. M. Johnston, F.G.S., that it is, in the present state of our knowledge, somewhat premature to endeavour to establish a co-relation with the great systematic divisions of the European Tertiary rock system. It is quite probable that when the true relation of the marine and terrestrial deposits of the older Tertiary division is better known, that it may be found necessary to adopt a compound term to define the age of the deposits, such as Oligo-eocene, in a similar manner to that which has been elsewhere adopted for passage beds, as the Jura-Trias in the Mesozoic and Permo-carboniferous in the Palaeozoic life system."

Mr. Stirling however omits to state that in concurring with Mr. Johnston he is going back to that gentleman's opinion first expressed in 1876, and that he is practically ignoring all the subsequent work done on our tertiaries up to 1898, as insufficient for even a relative classification.

Then we have the term Cretaceo-tertiary of Sir James Hector. In introducing this he remarks that "As far as possible the names usually applied to the equivalents of these formations in other countries have been employed, for the convenience of those to whom local names are unfamiliar; but in several instances the natural subdivisions of the strata which admit of being mapped overlap the conventional subdivisions. In such cases local or composite-terms have been used, as, for instance, 'Waipara' or 'Cretaceo-tertiary formation,' which includes the Lower Eocene and Upper Cretaceous of ordinary classifications, for the reason that no division-line that can be used for the purpose of practical geology can be interposed."

Professor Tate refers[3] to the New Zealand term as Cretaceo-Eocene. The wandering and modifying tendency is here distinct

1 Proc. Roy. Soc. Victoria, vol. iv., N.S., part 1, 1892, pp. 9-26.
2 Geol. Surv. Vic., Progress Report, No. ix., 1898, p. 123.
3 A.A.A.S., Adelaide, vol. v., 1893, p. 35.

enough, but Sir James Hector's local term fully meets all requirements, even accepting the stratigraphical and palaeontological interpretation to be the correct one. If, however, any mistake has been made in either respect, what becomes of Cretaceo-tertiary? If a time word must be used to give further information, it should not be difficult to fix on a usual one, tentatively at least, with a full explanation of local peculiarities or characteristics.

This method should recommend itself, and at the same time prevent much useless theorising.

Mr. J. E. Marr[1] expresses clearly a valuable point which may have some bearing here, he says, "There is an unconformity between the Cretaceous and Eocene beds of England, which is accompanied by a palaeontological break, but this break is more pronounced owing to difference of physical conditions, for we find abundance of gastropods in the Lower Tertiary beds, and a rarity of these shells at the top of the chalk of England, though where physical conditions were favourable for the growth of gastropods, their shells are found in the higher strata of chalk age, and the palaeontological break is not so apparent."

In the Mesozoic the first departure to note is Super- or Supra-Cretaceous used for what is generally known as Desert Sandstone in Central Australia and Queensland. The first use of this term appears to have been made by Mr. H. Y. L. Brown as Super-Cretaceous,[2] but as Messrs. Jack and Etheridge say, Mr. Brown does not distinctly aver that the "Super-Cretaceous" rocks described by him lie unconformably on the Cretaceous. Professor Tate and Mr. J. A. Watt in their report on the General Geology of the Horn Expedition[3] use Supra-Cretaceous and state, "No evidence of unconformability between Upper Cretaceous and Desert Sandstone was observable between Oodnadatta and the northern confines of the Cretaceous area, though there is some reason for the opinion the latter overlaps the former."

Messrs. Jack and Etheridge in their Geology of Queensland[4] clearly regard the Desert Sandstone as most conveniently

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1 Principles of Stratigraphical Geology, 1898, p. 65.
2 Report of Government Geologist, Adelaide, 1883.
3 Horn Scientific Expedition to Central Australia, Part iii., Geology, p. 65.
4 Geology and Palaeontology of Queensland and New Guinea, pp. 1, 3, and 510.

placed in the Cretaceous. The latter view is certainly the most reasonable, and appears to be the most worthy of acceptance, provided these general terms are ultimately accepted for use by colonial geologists.

The next term that attracts attention is Trias-Jura used in the Geology of Queensland by Messrs. Jack and Etheridge. These authors remark[1]—"This Series is of the utmost importance, because it contains the chief workable coal-seams in Queensland, or at least the principal seams at present worked. The organic remains are principally those of plants, with a strong Mesozoic facies, and oscillating, in all probability, between the Trias and Upper Oolite in age."

The Rev. J. E. Tenison Woods in his "Fossil Flora of the Coal Deposits of Australia" has, as already remarked by the above-mentioned authors endeavoured to refer many of these plants to horizons corresponding with those of their nearest allies of Europe and elsewhere, and in this way has accounted for the presence in Queensland of the Trias (?), Rhaetic or Lower Lias, Upper Lias and Jurassic. Messrs. Jack and Etheridge then state, "But our knowledge of these plant-beds is too young at present for such minute subdivision, and we know far too little of the association of the species one with the other, and the similar relation of their respective matrices, to assign minute geological horizons, on the chance of a mere guess, or hasty generalisation, turning out correct."

The term Jura-Trias has been used for certain Strata by some American geologists, but, according to Mr. R. S. Tarr,[2] "the term Newark is now used by the United States Geological Survey to include the strata of the eastern states, which were formerly called Triassic. The Jurassic and Triassic periods are not well developed in America."

In the Palaeozoic we may first note a marked tendency to drop the term Permian out of the systems altogether, for even such an authority as Professor Nicholson, though including in his general classification the Dyas or Permian System remarks,[3] "The

1 *Op. cit.*, p. 318.
2 Economic Geology of the United States, 1894, p. 47.
3 Manual of Palaeontology. Nicholson and Lydekker, 3rd edition, vol. i., p. 42.

deposits included under this name are more extensively developed in the European area than they are known to be in any other region, and it is doubtful if they can be regarded as a distinct System."

Then again we find several American authors using Permian as a minor subdivision of Carboniferous of the same value apparently as many of their local names and subdivisions.[1] Yet the necessity for a term intermediate between Carboniferous and Triassic is very striking, and many attempts have been made to satisfactorily fill the gap. Hence the unfortunate introduction of another compound name, Permo-Carboniferous, which is perhaps more misunderstood than most of the other composite terms.

In Australia we notice the late Mr. C. S. Wilkinson, Government Geologist of New South Wales, in his Notes on the Geology of that colony stating,[2] "The Upper Coal Measures have been provisionally classed as Permian, but it it doubtful whether they should not be regarded as a division of the great Carboniferous Series."

Dr. O. Feistmantel[3] indicates the same age terms as Wilkinson, and refers to the age of the Upper Coal Measures, New South Wales, as follows[4]:—"The age of these beds can be easily guessed; they lie above marine beds of Upper Carboniferous age, and consequently most naturally represent the close of the Palaeozoic Epoch, or they can be considered as approximately the representatives of the Permian."

Later in the same work[5] the above author gives a table in which the term Permo-Carboniferous is used to include in New South Wales: 1. The Lower Coal Measures, 2. The Upper Marine Beds, 3. Newcastle Beds; in Victoria the Bacchus Marsh Beds; and in Tasmania the Mersey River Beds. In a later table[6] he also includes the Lower Marine Beds, New South Wales, under the same head.

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1 Elements of Geology, J. Le Conte, p. 284 also, Economic Geology of the United States, by R. S. Tarr, p. 47; &c.

2 Notes on the Geology of New South Wales, 1882, p. 51.

3 The Coal and Plant-Bearing Beds of Palaeozoic and Mesozoic Age in Eastern Australia and Tasmania, p. 41.

4 *Op. cit.*, p. 64.

5 *Op. cit.*, p. 66.

6 *Op. cit.*, p. 182.

Mr. R. Etheridge[1] gives "the general geological subdivisons of the Carboniferous and Permo-Carboniferous rocks of New South Wales as at present understood by the Geological Survey :"

Permo-Carboniferous.	Upper Coal Measures. Middle Coal Measures. Upper Marine Series. Lower Coal Measures. Lower Marine Series.
Carboniferous.	

Further he states,[2] "The classification formerly adopted by various authors was the subdivision of our New South Wales rocks immediately above the Devonian into Lower Carboniferous, Carboniferous, and Permian. Recent palaeontological investigations will probably lead to a modification of this classification, in so far that the whole of the beds below the Lower Marine Series may be regarded as more truly allied to the Carboniferous simply. On the other hand, that series and the beds above, viz., the Upper Marine and the whole of the Coal Measures, having an affinity with both Permian and Carboniferous might be termed Permo-Carboniferous, "At the same time great caution must be exercised in assimilating our geological subdivisions strictly with those of the old world."

Mr. J. E. Marr may next be profitably quoted from a recent work[3] as follows :—"As an illustration of the local character of a palaeontological break we may cite the case of the Carboniferous and Permian systems of Britain. The rocks are separated from one another in our area by a physical and palaeontological break, but in parts of India, and other places, we find a group of rocks now known as the Permo-Carboniferous rocks which contain a fauna intermediate in character between those of the Permian and Carboniferous systems, and a study of this fauna shows that the hiatus which exists locally is filled by the species contained in the Permo-Carboniferous rocks."

As another recent expression of opinion by eminent English geologists, Professor C. Lapworth[4] states, "In the Permian strata

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1 Monograph of the Carboniferous and Permo-Carboniferous Invertebrata of New South Wales, Part I., Coelenterata, 1891, p. 3.

2 *Op. cit.*, p. 4.

3 Principles of Stratigraphical Geology, 1898, p. 64.

4 Intermediate Text-Book of Geology, 1899, p. 282.

of Southern India, Australia, South Africa, and South America, the flora of the strata classed as Permian is very different from that of the Permian of Europe, being largely composed of plants of Mesozoic type." And again[1] "In Southern India, Australia, and South Africa, the Permian Beds present us with a still more striking facies. ...... The plants include a majority of forms such as Glossopteris and Phyllotheca, which, in Europe, occur only in Mesozoic strata; and these are sometimes associated with forms like Sphenopteris and Callopteris, etc., of a Palaeozoic aspect." Following this he refers to the Bacchus Marsh Beds, Victoria, as Permian, the Newcastle Coal Measures in all probability Permian, and a lower marine series and an upper fresh-water series in Queensland as Permian. Now it may be asked how far it is possible to reconcile the above expressions of opinion. It seems to me that instead of the way having been made clearer by the use of the composite term, it has been much encumbered by conflicting and sometimes confusing views, especially to students.

The remarks of Professor David in his presidential address to the Linnean Society of New South Wales in 1893[2] clearly show some further difficulties that have to be contended with. I make the following quotation:—"Unfortunately the expression Permo-Carboniferous is used with two very different meanings by Queensland and New South Wales geologists respectively. In New South Wales the term Permo-Carboniferous is applied to a group of rocks partly marine partly fresh-water, the fresh-water beds being specially characterised by the prevalence of *Glossopteris* and Gangamopteris, while the marine beds contain a fauna partly of Permian and partly of Carboniferous affinities. This is the equivalent of the Middle and Upper Bowen Series of Queensland, but in the latter colony an immense series of older beds is included under the term Permo-Carboniferous, as for example the Lower Bowen, the Star, and the Gympie series."

Then we find Carbonifero-Devonian has been used by Professor David for rocks in the Mount Lambie District of New South Wales.[3]

1 *Op. cit.*, p. 284.
2 Proc. Lin. Soc. N. S. Wales, vol. viii., n.s., p. 584.
3 *Loc. cit.*, p. 582.

Under the head of Devonian in New South Wales the late Mr. C. S. Wilkinson[1] makes the following statement:—"Under this head is classed an important suite of rocks, consisting of sandstones, conglomerates, limestones, and shales, the lower beds of which are related by their fossils to the Silurian and the upper beds to the Carboniferous. Consequently until their stratigraphical relationship has been ascertained by actual survey, some difficulty will be experienced in assigning definite limits to these formations." Subsequently[2] Mr. Wilkinson remarks on the high state of development of the class Actinozoa in the "Siluro-Devonian Period" as compared with their remarkable diminution in the Carboniferous and Permo-Carboniferous times.

Siluro-Devonian seems to have crept in to stay, for we find other references to it, and descriptions of new fossils from Siluro-Devonian rocks of New South Wales by Mr. R. Etheridge, junr.[3]

With regard to Cambro-Silurian, here again we have more than the one view as to its exact significance. The general use of this is well expressed by Dr. Kayser.[4] "It is now almost universally admitted that the Cambro-Silurian rocks fall naturally into three great divisions, each characterised by its own peculiar fauna. Speaking broadly, Sedgwick applied the term Cambrian to the two lower; Murchison at first included in his Silurian the two upper divisions, but ultimately took in a large part of the lowest also. The greater number of geologists, perhaps, apply the term Cambrian to the lowest division, and of Silurian to the two upper." The oscillation of opinion on the use of the general classificatory terms for the subdivisions of Lower Palaeozoic even by our most eminent English geologists is very great indeed, and may perhaps be best shown for our present purpose by the following table copied from the above quoted work:—

---

1 Notes on the Geology of New South Wales, by C. S. Wilkinson, 1882, p. 42.

2 A Monograph of the Carboniferous and Permo-Carboniferous Invertebrata of New South Wales, Part i., Coelenterata, by R. Etheridge, junr.; Letter of Transmittal, by C. S. Wilkinson, p. vii., 1891.

3 On the occurrence of a Stromatoporoid allied to *Labechia* and *Rosenella*, in the Siluro-Devonian rocks of New South Wales by R. Etheridge, junr., in the Records of the Geological Survey, vol. iv., pt. iii., 1895, p. 134.

4 Text Book of Comparative Geology by E. Kayser, Ph.D., translated and edited by Philip Lake, M.A., F.G.S., 1893, p. 29.

TABLE II.

<table>
<tr><th></th><th>Sedgwick.</th><th>Murchison.</th><th>Geological Survey.</th><th>Lyell.</th><th>Lapworth.</th></tr>
<tr><td>Downtonian.</td><td rowspan="3">Silurian.</td><td rowspan="2">Upper Silurian.</td><td rowspan="2">Upper Silurian.</td><td rowspan="3">Upper Silurian.</td><td rowspan="3">Silurian.</td></tr>
<tr><td>Salopian.</td></tr>
<tr><td>Valentian.</td><td rowspan="4">Lower Silurian.</td><td rowspan="7">Lower Silurian.</td></tr>
<tr><td>Bala Series.</td><td rowspan="7">Cambrian.</td><td rowspan="3">Lower Silurian.</td><td rowspan="3">Ordovician.</td></tr>
<tr><td>Llandeilo.</td></tr>
<tr><td>Arenig and Llanvirn.</td></tr>
<tr><td>Tremadoc.</td><td rowspan="3">Primordial Silurian.</td><td rowspan="4">Cambrian.</td><td rowspan="4">Cambrian.</td></tr>
<tr><td>Lingula Flags.</td></tr>
<tr><td>Menevian.</td></tr>
<tr><td>Harlech, etc.</td><td>Cambrian.</td><td>Cambrian.</td></tr>
</table>

Still in the face of this we find Cambro-Silurian used by Tasmanian geologists with a different signification, and again in Canada it is used in some of the Geological Survey Reports with anything but a clear signification. We have then even on this cursory examination a rather peculiar mixture of terms as may be seen from an examination of Table III., and with regard to the interpretation of them, that seems to be a purely optional matter.

TABLE III.

Cainozoic or Tertiary	Recent	
	Pleistocene	
	Pliocene	
	Miocene	
	Eocene -	Oligo-eocene.
		Cretaceo-Tertiary. Cretaceo-Eocene.
Mesozoic or Secondary	Cretaceous -	Super-Cretaceous. Supra-Cretaceous.
	Jurassic -	Jura-Trias.
	Triassic -	Trias-Jura.

Palaeozoic or Primary	Permian - -	Permo-Carboniferous.
	Carboniferous	
		Carbonifero-Devonian.
	Devonian -	
		Siluro-Devonian.
	Silurian - -	
	Ordovician -	Cambro-Silurian.
	Cambrian -	
	Pre-Cambrian	

As an expression of British opinion on geological classification I include Table IV., that given by Nicholson and Lydekker in their "Manual of Palaeontology," in which the use and position of Quaternary may be specially noticed.[1]

TABLE IV.

Kainozoic or Tertiary Group.	Recent Formations.
	Quaternary or Pleistocene Formations.
	Pliocene System.
	Miocene System.
	Eocene System.
Mesozoic or Secondary Group.	Cretaceous System
	Jurassic System.
	Triassic System.
Palaeozoic Group.	Dyas or Permian System.
	Carboniferous System.
	Devonian System.
	Silurian System.
	Ordovician System.
	Cambrian System.

For the American tangle, Table V. may be examined as given by Mr. Ralph S. Tarr, B.S., F.G.S.A., in his "Economic Geology of the United States," or for additional particulars, if required, reference may be made to James D. Dana's "Text-Book of Geology," or to J. Le Conte's "Elements of Geology."

TABLE V.

Cenozoic	Quaternary - -	Recent.
		Pleistocene.
	Tertiary - - -	Pliocene.
		Miocene.
		Eocene.

1 Manual of Palaeontology, vol. i., pp. 41, 42.

Mesozoic	Cretaceous		Laramie.
			Upper Cretaceous.
			Lower Cretaceous.
	Jura-Trias		Jurassic.
			Triassic.
Palæozoic	Carboniferous		Permian.
			Coal Measures.
			Lower Carboniferous or Sub-Carboniferous.
	Devonian		Catskill.
			Chemung.
			Hamilton.
			Corniferous.
	Silurian	Upper Silurian	Oriskany.
			Lower Helderberg.
			Salina.
			Niagara.
		Lower Silurian	Trenton.
			Canadian.
	Cambrian		Upper Cambrian.
			Middle Cambrian.
			Lower Cambrian.
	Algonkian		Keweenawan.
			Upper Huronian.
			Lower Huronian.
	Archean		Laurentian (Fundamental complex).

For New Zealand the provisional table given by Sir James Hector in his "Outline of the Geology of New Zealand" for the Indian and Colonial Exhibition in 1886, was as follows:—

TABLE VI.

Post Tertiary and Recent.
Pliocene.
Upper Miocene.
Lower Miocene.
Upper Eocene.
Cretaceo-Tertiary.
Lower Greensand.
Jurassic.
Liassic.
Triassic.

Permian.
Carboniferous.
Devonian.
Upper Silurian.
Lower Silurian.

At this stage the question might be reasonably asked, is there any necessity for such confusion of terms? Surely something can be done by this Association to bring about more uniformity, however tentative, in the use of our time scale. We look up various works, papers, and official reports of the various colonies, and from such, we find it absolutely impossible to correlate with any degree of safety even the deposits immediately on opposite sides of the River Murray, let alone the deposits at a somewhat greater distance apart. This appears to be hardly the state of affairs likely to tend to a very permanent advancement of our knowledge of Australian Geology, and that, I take it, should be one of the cares of this section of the Association.

In speaking of the English Record, Sir A. Geikie remarks[1] "The nomenclature adopted for these subdivisions bears witness to the rapid growth of geology. It is a patchwork in which no uniform system or language has been adhered to, but where the influences by which the progress of the science has been moulded, may be distinctly traced." The same authority, as already quoted in the present paper, states that it is generally admitted that the names best adapted for general use are those taken from the region where a formation or group of rocks is typically developed.

Is there nothing typical in Australia? Why is there such a strong tendency towards the use of the British terms, even after it has been proved that the colonial representatives are essentially different in a great many respects. The endeavour to bring this out is apparently shown in the additional introduction of the composite terms already referred to, but surely some local name would meet the present requirements better, until sufficient detailed knowledge of the deposits has been obtained to enable an appropriate general-term to be chosen of local significance.

---

1 Text-Book of Geology, 3rd ed., 1893, p. 679.

Bearing on this Professor Tate[1] justly remarks—"The faunal peculiarities of the several formations are, moreover, such as to raise the question—Are we right in adopting the chronology of the European School?" He then goes on to speak of the palaeontological overlap of the Palaeozoic and Mesozoic in the Newcastle Coal-series, and a probable overlap between Mesozoic and Cainozoic. Might there not be ground here for a typical Australian development? Professor Tate's further remarks on this subject[2] are well worthy of being quoted in full—"The attempts to bring the order of succession of the Australian stratified deposits in unison with that of the country in which so many of the geologists have gained their early impressions have at no time been satisfactory, and the difficulties are daily increasing. Even at an early period of our geological history there had been grasped the important idea that the geology of the typical area of Silurian, Devonian and Carboniferous of Europe was not exactly comparable with that of Australia. This is indicated by the hesitancy on the part of authors to assign a given group of fossils to a definite epoch, and by the discordant results arrived at when the age has been the subject under consideration. Despite the desire to cling to home associations, I think the time is fast approaching when it will be deemed advisable to found an independent school for Australian Stratigraphy."

One of the objects of the International Geological Congress is said to be towards the unification of geological nomenclature throughout the world. This, however, seems to be a somewhat large as well as a difficult undertaking, and it is somewhat doubtful how far a general acceptance would be procured. Still, legitimate work in this direction should receive the utmost consideration and assistance.

Next we come to a source of still further trouble, namely, the application of local British terms to colonial horizons, which, on the face of it, is an absurd stretch at correlation generally upon the most meagre evidence. As a striking instance in this direction, note Professor McCoy's remarks on one fossil, namely,

---

1 Presidential Address A.A.A.S., Adelaide, vol. v., 1893, p. 34.

2 *Loc. cit.*, p. 35.

Phascolomys plioceuus[1] from "the hard ferruginous gold cement of Dunolly,"—"Of great interest as thus showing that our gold drifts are not 'alluvial,' but of the more ancient Pliocene Tertiary period, at least as old as the Mammaliferous Crag; thus corresponding in age with the gold drifts of the Ural."

In Victoria we have in the Palaeozoic the introduction of such subdivisional terms of the Silurian and Ordovician as—Ludlow, Wenlock shales, May Hill sandstones, Bala rock, Llandeilo flags, for which the late Sir Frederick McCoy has been responsible, and as a consequence we find these terms on our geological maps and quarter-sheets, and through our various geological reports. We may also note references to Arenig, Tremadoc and Caradoc.[2] Is it wise to accept these subdivisions from our colonial work?

We find then, according to Professor McCoy,[3] Llandeilo flags or Bala rock to the north of Camp, Lancefield, Llandeilo flags at Bendigo, also in the parish of Bulla, etc.; Bala at Bulla[4]; Wenlock shale at Keilor[5]; May Hill sandstone at Moonee Valley[6]; Upper Ludlow at Johnston-street, Collingwood[7]; and many others needless to quote. The Lilydale limestone has been referred to the Wenlock series by Mr. R. Etheridge, junr.,[8] and the Rev. A. W. Cresswell.[9]

In connection with the Ordovician Rocks of Victoria, Mr. T. S. Hall in a recent paper[10] remarks, "The general sequence of the Victorian graptolites may be correlated with that of the Northern Hemisphere, but experience has shown that it is unsafe to push the analogy too far, and that the only safe method is that of detailed stratigraphical work. Thus we find forms here associated which elsewhere are separated by intervening zones; and, on the other hand, forms elsewhere associated may be here separated." In our Tertiary series also far too much has been made of resemblances to or differences from English or European representatives.

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1 Prod. Pal. Vic., Dec. i., p. 22.
2 Lapworth, Geological Magazine; T. S. Hall, A.A.A.S., Sydney, vol. vii., 1898, p. 402.
3 Prod. Pal. Vic., Dec. i., p. 9.
4 *Op. cit.*, Dec. ii., p. 36.
5 *Id.*, p. 37.
6 *Op. cit.*, Dec. iii., p. 20.
7 *Op. cit.*, Dec. vi., p. 27.
8 Records of the Australian Museum, vol. i., No. 3, p. 60, and No. 7, p. 125.
9 Proc. Roy. Soc. Vic., vol. v., n.s., 1893, p. 38.
10 Geol. Mag., n.s., Dec. iv., vol. vi., No. x., Oct. 1899, p. 440.

Thus Professor McCoy has stated,[1] "This does not alter my opinion at all of these deposits which the Geological Survey of Victoria may safely accept on my authority as of newer date than any true Eocene Tertiary type, such as the London clay of the south-east of England, or the corresponding part of the Basin of Paris." Again attributable to the same author from the same report we have—"In the long list of fossils[2] sent to me there are no species characteristic of indisputable Eocene type sections. By far the greater number of the extinct species are peculiar to the Australian strata, and none of them are found in typical Eocene strata elsewhere." It is to be hoped there are not many colonial geologists or even others to be found to uphold such views as these. The consequence of this is to place much of the work of the Geological Survey of our colony in a very peculiar and rather unenviable position.

This expressed in a brief table, without reference to detailed localities, which may be consulted in a previous paper to this Association,[3] appears as follows:—

Recent Authors.	Geological Survey.
Pliocene.	Newer Pliocene.
Miocene.	Older Pliocene.
Eocene.	Miocene.
	Oligocene.
	Miocene.

I feel that this matter has only been very imperfectly brought forward, but if I have been able to show the somewhat chaotic state of things into which we appear to be drifting, this should

1 Geo. Surv. Vic., Progress Report, No. viii., 1894, p. 48.

2 Remarks on the Tertiaries of Australia, with a Catalogue of Fossils by G. B. Pritchard, South Australian School of Mines and Industries Report, 1892.

3 A.A.A.S., Brisbane, 1895, vol. vi., pp. 359-361.

surely call for some action on the part of this Association to at least attempt to draw up and gain recognition for a more uniform system of geological nomenclature for use throughout Australia, so far at least as the main divisions and subdivisions are concerned, and the further minor divisions to be essentially colonial.

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Art. X.— *Two New Species of Frogs from Victoria.*

By BALDWIN SPENCER, M.A., F.R.S.

[Read 6th September, 1900.]

In 1891, Mr A. H. S. Lucas published a list of the Amphibian fauna of Victoria in which he included all the forms then recorded from the colony, the total number being 17 species.[1] It might have been thought that the damp cool gullies of both Victoria and Tasmania would have been peculiarly well adapted for the development of a rich Amphibian fauna, but such does not appear to have been the case, and both of the latter colonies are decidedly poorer in this respect than New South Wales. So far as we know yet, the few species which exist in Tasmania are all identical with common Victorian forms. As a general rule, the species of Amphibia met with in Victoria are very widely distributed and exist in considerable numbers. On the other hand there are a few species, whose numbers will doubtless be added to, which are notable for their restricted distribution, and when the, as yet, little zoologically explored districts of the colony, such as Croajingolong and the Cape Otway country, have been more fully searched, our Amphibian fauna may prove to be richer than it appears to be at the present time. I am much indebted to Mr. C. Frost and to Mr. R. Hall for the opportunity of adding to our Amphibian fauna the two species now described.

In 1898 Mr. Frost was camped out during cold wet weather on Mount Baw Baw, which forms part of the Great Dividing Range in Victoria. Having captured a specimen of the "tiger" snake (*Hoplocephalus curtus*) he put it into a bag, in which it remained for two days. At the expiration of this time, Mr. Frost found, on opening the bag, that the snake had disgorged five specimens of a frog which it had evidently, owing to their comparatively good state of preservation, eaten only a short time

1 Proc. R. S. Vict., vol. iv., pt. 1, 1892. "Notes on the distribution of Victorian Batrachians with description of two new species."

previous to its capture. Fortunately Mr. Frost was able to secure at a latter time, two more specimens in a fresh state. The specimens were sent to my friend, Mr. J. J. Fletcher, to whose work we owe much in regard to our knowledge of Australian Amphibia, and, as they were Victorian forms, he most generously suggested that they should be described by myself.

It is somewhat difficult to fix the exact relationship of this frog to other Australian Cystignathids; it has the general body form of Heleioporus, but otherwise has little relationship to the latter, from which it differs in the entire absence of web, in the direction of the pupil, and in the position of the vomerine teeth. From Cheiroleptes it differs also in the absence of web (which, though it may be very small in these two genera, is always distinctly visible), and, though not to so great an extent as in Heleioporus, in the position of the vomerine teeth and in the unapposibility of the first finger. It is most closely allied to Limnodynastes, but differs from this in the absence of the vertical pupil and to a certain extent in the direction of the vomerine teeth, which form two short distinct rows inclined at an angle to one another, and do not extend sideways beyond the level of the inner edges of the choanae.

Philoria, gen. nov.

Pupil horizontal. Tympanum not visible. Tongue subcircular, free behind. Vomerine teeth in two inclined rows behind the level of the choanae. Fingers and toes free, the tips not dilated. Outer metatarsals firmly united. Diapophyses of sacral vertebrae distinctly dilated.

Philoria frosti, sp. n.

Habit fairly stout, much resembling that of *Heleioporus pictus*. Tongue subcircular, slightly nicked and free behind. Vomerine teeth in two series inclined to one another at an angle behind the level of the choanae, and not extending outwards beyond the level of the inner edge of the choanae. Head broader than long; snout rounded, slightly longer than the orbital diameter; nostril nearer to the eye than to the tip of the snout; canthus

rostralis not strongly marked. Interorbital space as broad as the length of the orbit. Tympanum not visible. Fingers blunt and free; first finger not extending so far as the second. Toes short and blunt, no trace of webbing; subarticular tubercles present; three metacarpal tubercles, the inner one strongly, the outer feebly developed. The inner metatarsal tubercle small and blunt. Hind limb short, stout and strongly built; carried forwards the tibio-tarsal articulation barely reaches as far forwards as the shoulder. Upper eyelids, tympanic region, the top of the head and dorsal surface of the body, the upper surface of the arm and fore arm and the upper surface of the leg covered with small warts arranged in roughly longitudinal rows along the back. A very large and prominent triangular shaped parotid gland is present on either side extending backwards over the shoulder region; the longest side of the triangle runs parallel to the mid dorsal line and these two sides are separated from one another by a space which is narrower than that between the orbits. From the posterior angle a special row of warts somewhat larger than the rest, runs backwards to the groin and is continued forwards over the surface of the gland which is otherwise comparatively smooth. Upper surface of body and limbs a general dark brown colour with here and there small irregular light patches; groins and under surface of body and limbs yellowish, mottled with brown.

Length from snout to vent, 44 mm.

Habitat, Mount Baw Baw, Victoria. Collected by Mr. C. Frost.

Type, in the National Museum, Victoria.

Hyla maculata, sp. n.

Tongue subcircular; free and slightly nicked behind. Vomerine teeth in two small groups close to the middle line behind the level of the choanae. Head decidedly broader than long. Snout as long as broad; truncate and slanting downwards so that the nares are vertically on a level with the margin of the upper jaw. Canthus rostralis distinct; the loreal region oblique and slightly concave; interorbital space nearly twice as broad as the upper eyelid. Tympanum not visible. Fingers very slightly

webbed; toes completely webbed. Discs on the fingers slightly larger than those on the toes. Subarticular tubercle present, no outer metatarsal tubercle. A distinct fold extending over the tympanic region to the shoulder. The hind limb being carried forwards the tibio-tarsal articulation reaches the anterior canthus of the eye. Upper surface of the body covered with minute pits, the closely apposed margins of which present a finely reticulate appearance; lower surface granulate. A distinct fold along the inner edge of the tarsus. Colour, olive grey above, blotched with darker markings; the same on the upper surfaces of the limbs.

Length from snout to vent, 50 mm.

Habitat, Powong, Victoria. Collected by Mr. R. Hall.

Art. XI.—*Cyphaspis spryi, a New Species of Trilobite from the Silurian of Melbourne.*

By J. W. GREGORY, D.Sc.,

Professor of Geology, Melbourne University.

(With Plate XXII.)

[Read 4th October, 1900.]

During the course of some excavations near Government House, South Yarra, Mr. F. P. Spry has obtained an interesting series of fossils from the Melbourne Silurian beds. The most important fossil in the collection is a trilobite represented by three well-preserved specimens and several fragments. Mr. Spry has kindly lent me the material for examination and description. The trilobite is a new species of the genus *Cyphaspis*, and I have much pleasure in naming it after its discoverer.

Cyphaspis spryi, n. sp.

Description.—Body oval. Cephalic shield broad and short; anterior margin well rounded. Limb of medium width, projecting in front as a blunt, short spine.

Glabella tumid; approximately uniform in width. Of the furrows only the posterior pair is visible; and these two furrows are deep and completely cut off the posterior lobe. The lobes are well rounded behind, and pointed in front.

Facial suture begins near the genal angle, bends sharply inwards to the eye, and then curves gently outward to the anterior margin, the cranidium being in front, twice the width of the glabella.

Genal angles developed as short thick spines, directed outward, but continuing the curve of the lateral margin of the cephalic shield.

Thorax of fourteen segments; axis narrower than the pleura; well raised. The pleural grooves reach to the end of the pleura. Surface not granulate.

Pygidium short, narrow; very indistinctly separated from the thorax. Axis tapering uniformly backward from the thoracic portion of the axis. Margin smooth and semicircular, but the margin is notched by faint grooves.

DIMENSIONS.

	Specimen from near Yarra Bridge.	Specimen from Anderson Street.	Third Specimen.
	mm.	mm.	mm.
Length	20	14 + x	14
Length of cephalon from anterior end of spine	8	5·5 or 6	6
Length of glabella	4	3	3
From anterior end of glabella to base of cephalic spine	2·8	2	2
Width of glabella	3·5	3	3
Width of cephalon	12	10	10
Length of genal spines	—	3	2·75
Thorax—Width of axis	3	2·75	2·5
Width of pleura	4	3·25	3
Width of thorax	11	9	8·5
Pygidium—Length	2·5	—	2
Breadth of anterior margin	6·5	—	6
Number of segments	6 or 7	—	7

Distribution.—Silurian: South Yarra, Melbourne.

Affinities.—This trilobite is a *Cyphaspsis*, and specifically its most marked character is the presence of the anterior median spine. Etheridge Jun. and Mitchell[1] have described several species of this genus from New South Wales, from all of which *C. spryi* differs in the absence of the anterior spine. Its nearest Australian ally is *C. bowningensis*, Mitch.,[2] which it resembles by

1 R. Etheridge Jun. and J. Mitchell. The Silurian Trilobites of New South Wales. Proc. Linn. Soc. N.S.W., ser. 2, vol. viii. (1894), pp. 170-172, pl. vi., fig. 3, pl. vii., fig. 31-k.

2 J. Mitchell. On some new Trilobites from Bowning, Proc. Linn. Soc., N.S.W., new ser. vol. ii. (1887), p. 438, pl. xvi., fig. 3.

the size of the genal spines and the shape of the glabella; but the glabella is not granulate, the spines are less outwardly directed, and there is no dorsal spine as in one sex of *C. bowningensis*. There is moreover no trace of the anterior furrow which, as Etheridge and Mitchell suggest, render the New South Wales form a possible ally of *Phaetonides*.

Among European trilobites the nearest species is *C. burmeisteri*[1] or *C. halli*,[2] both of which come from the lower part of the Silurian (syn. Upper Silurian); amongst other specific differences *C. halli* has 17 thoracic segments and 4 ridges on the pygidium; and *C. burmeisteri* has 8 ridges on the pygidium and from 11 to 15 thoracic segments and no azygous cephalic spine.

The precise age of *C. spryi*, must be left for the present somewhat uncertain. Its nearest European allies *C. halli* and *C. burmeisteri* both come from Barrande's stage E or the lower part of the Silurian (*i.e.* of the Upper Silurian of the Victorian Geological Survey). Amongst other fossils found with *C. spryi* is the hinder end of a *Homalonotus* which is almost identical with *H. harrisoni*, M'Coy;[3] there is one slight difference. In *H. harrisoni*, according to M'Coy, the sulcus is along the middle line of the thoracic segments, whereas, in the specimen found by Mr. Spry, the sulcus is posterior in position. This difference may possibly be specific; the South Yarra *Homalonotus* cannot be satisfactorily determined until the cephalic shield be discovered. But the occurrence of this *H. aff, harrisoni* with the *C. spryi* is in favour of the South Yarra beds being low in the Silurian system, for M'Coy originally assigned the former species to the Llandovery series.

On the other hand a somewhat later date for this horizon is suggested by the occurrence of *Hapalocrinus victoriae*, Bath., with the *C. spryi*; for according to Bather,[4] *Hapalocrinus* ranges from the Middle Silurian to the Lower Devonian.

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1 Barrande. Système Silurien du Centre de la Bohême, p. 484, pl. xviii., fig. 61-71 and 1846. Not. prél. p. 59.

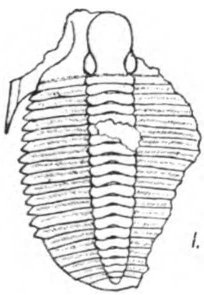
2 Barrande. Système Silurien du Centre de la Bohême, pt. i. (1852), p. 483, pl. xviii., fig. 35-37.

3 M'Coy. Prod. Pal. Vict. Dec. iii. (1876), p. 19, pl. xxiii., fig. 11.

4 Bather. Geol. Mag., Dec. iv., vol. ix. (1897), p. 345.

DESCRIPTION OF PLATE XXII.

1. A specimen with imperfect cephalon. × 2 dia. From near the Botanical Gardens, S. Yarra. (Presented to the University Collection by Mr. F. P. Spry).
2. Cephalon of another specimen from the same locality. × 2 dia. (Spry Coll.)



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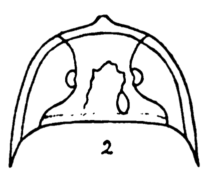

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Art. XII.—*Further Descriptions of the Tertiary Polyzoa of Victoria.—Part V.*

By C. M. MAPLESTONE.

(With Plates XXIII., XXIV.)

[Read November, 8th 1900.]

Cellaria grandis, n. sp. (Pl. XXIII., Fig. 1).

Zoarium compressed, ligulate, zoöecia on each face. Zooecia quadrangular, diamond shaped; angles occasionally rounded; margins raised; surface minutely granular, much depressed. Thyrostome arched above, slightly incurved below; a small denticle at each side of lower lip. Avicularia situated at the distal end of zooecia; opening semicircular.

Locality.—Cape Otway (J. Dennant).

This is a very large species. I have two specimens, both imperfect at the ends, that from which the figure of the zooecia is drawn is half-an-inch long and one-eighth wide, both ends being broken; the other one is a quarter-of-an-inch long and three-sixteenths wide. There is a row of zooecia on the edge of the zoarium, in which respect it differs from the other flat species (*C. angustiloba*, *C. acutimarginata* and *C. biseriata*). The specimens are not very well preserved, only one of the zooecia showed the denticles inside the lower margin of the thyrostome (Fig. 1*a*).

Cellaria contigua, McG., var. corioensis, nov. (Pl. XXIII., Fig. 2).

Zoarium cylindrical. Zooecia elongated, hexagonal, upper and lower extremities broad; arranged quincuncially, surface depressed; margins very narrow and thin. Thyrostome lofty, with a thin raised margin; lower lip incurved, with an internal denticle on each side. Avicularia vicarious, of the same size as

the zooecia, pointed at the distal end and slightly encroaching on the zooecium above; the two upper margins incurved, mandible pointing upwards.

Locality.—Corio Bay (T. S. Hall).

The zooecia are very like those of the typical *C. contigua*, but the avicularia are different; they are more like those of *C. dennanti;* they are as large as, and take the place of, a zooecium; they are upright, or parallel to the axis of the zoarium, whereas those of the type are only about half the length of a zooecium and are always slanting either to the right or left, being placed between the sloping sides of the zooecia. Fig. 2 shows the avicularia somewhat in side view; this portion of the zoarium was chosen for illustration as there were three zooecia it it which had the thyrostomes perfect; in most of them the thyrostome is either imperfect or obscured by the matrix. Fig. 2*a* shows the front view of another avicularium.

This may be a new species but I prefer at present to treat it as a variety of *C. contigua.*

Melicerita elliptica, n. sp. (Pl. XXIII., Fig. 3).

Zoarium compressed, ligulate, zooecia on both faces. Zooecia elongated, hexagonal, with upper and lower margins transverse; occasionally they are pointed distally and are then five-sided; Surface granulated, margins raised. Thyrostome elliptical. Avicularia cucullate, situated on the proximal part of the zooecia.

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

I have several specimens, but the one from which the figure is taken is the only one which shows avicularia; they are situated in an uncommon position, being on the surface of the zooecium and not vicarious. As the thyrostome differs from those of the *Cellariae* in being elliptical and having no internal denticles and as it is similar to that of *Melicerita dubia*, Busk (C.P. xxx., p. 97, pl. xxxiii., fig. 10), I provisionally place it in the same genus.

Cellaria gigantea, n. sp. (Pl. XXIII., Fig. 4).

Zoarium large, cylindrical. Zooecia very large, irregularly hexagonal, margins raised; distal margin arched, lateral margins

almost in a continuous curve, angle only just perceptible; surface sunken and granular. Thyrostome arched above, nearly straight below; margins raised, a broad narrow plate inside lower margin, and a thick broad process depending from the inside of the upper margin.

Locality.—Mitchell River (J. Dennant).

This I place in *Cellaria* on account of the plates projecting internally from the upper and lower margins of the thyrostome; had not these been present I would have placed it in *Macropora*. One specimen shows that it probably branched dichotomously.

Membranipora bellis, n. sp. (Pl. XXIII., Fig. 5).

Zoarium encrusting. Zooecia oval, with narrow raised margins, upper margin incurved; several (6·10) irregular, more or less branched spines on upper margin. A large capitate avicularium on one side of the zooecia with a large boat-shaped base, or cell, which bears upon the outer surface tubercles and spines.

Locality.—Lower beds, Muddy Creek (J. Dennant).

This species resembles *M. intermedia* (Kirkpatrick), as the avicularia are covered with tubercles, but the shape of the zooecium is different, the upper margin being incurved, the number of spines on the upper margin is greater, being from 6 to 10 instead of 2; the avicularia are different, being directed upwards, bearing short spines as well as tubercles, and not having a branching spine growing out of the lower portion.

Membranipora globulosa, n. sp. (Pl. XXIII., Fig. 6).

Zoarium encrusting. Zooecia irregularly oval, with narrow raised margins. Two spines on the distal end with a branching spine on one side directed downwards over the aperture Avicularia opening upwards, with a branching spine directed upwards from the surface, margins of mandibular chamber raised, outside smooth. Ooecia globose, wider than high, covered with small tubercles.

Locality.—Lower beds, Muddy Creek (J. Dennant).

This is very near *M. intermedia*, but the avicularia face upwards and the outside is smooth.

Membranipora radicifera, Hincks, sp. (Pl. XXIII., Fig. 7).

I give a figure of a specimen of this species as it bears an ooecium, which is not mentioned by Dr. MacGillivray in his monograph, and also for comparison with the figures of *M. bellis* and *M. globulosa.*

Locality.—Balcombe Bay, Mornington (T. S. Hall).

These last three species and *M. intermedia* are closely allied, but they appear to me to be specifically distinct.

Membranipora aviculifera, n. sp. (Pl. XXIII., Fig. 8).

Zoarium encrusting. Zooecia oval; opesia oval, occupying nearly two-thirds of area, narrow raised margins. Four spines on distal border; proximal part depressed. Ooecium galeate, much raised, with a subtriangular smooth depressed area in front, bordered by two narrow ridges with a narrow depressed space between them; surmounted by 1·3 (?) avicularia.

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

This species, although the zooecia are not quite perfectly preserved, is very distinct by reason of the ooecia being surmounted by avicularia, which is a very uncommon occurrence. There are three ooecia in the specimen figured (the only one found), and they vary. The one on the left hand, at the top, has apparently three avicularia, or, as the mandibular cavities are not visible, they may be only blunt spines. The one on the right hand has apparently two, although these may be, for the same reason as in the other, merely spines, the depressed area between the ridges on the front is triangular. Upon the third one (on the right side nearer the bottom) there is a subcapitate avicularium on a short stem with a triangular mandibular area. The zooecium on the extreme left hand, at the top of the figure, is the only one in which the opesia and margin appear to be perfect; in addition to the four spines it bears a thick blunt one protruding from below the distal margin, which appears to be free, it probably was the last zooecium formed. Below the opesia in most of them is a hemispherical cavity, which I think possibly may be the basal wall of an ooecium, the ooecium itself being broken off.

Membranipora longipes, n. sp. (Pl. XXIII., Fig. 9).

Zoarium encrusting. Zooecia quincuncial, racquet-shaped, with very long narrow proximal part, surface finely granulated, margins raised, smooth. Opesia subtriangular or sub-quadrate, the lower margin descends rather abruptly, and there is a short broad extension downwards into the cavity of the zooecium. A small oval avicularium with broad mandible at the base of the zooecia.

Localities.—Mornington (T. S. Hall); Aire Coastal Beds (Messrs. Hall and Pritchard).

The specimen figured is a single one from Mornington. I afterwards found several specimens in the Aire Coastal Beds deposit. It bears a resemblance to *M. cochleare* (McG.), but is distinguished therefrom by the very long narrow proximal portion, its smooth margins, and by the presence of the avicularia, these vary somewhat in shape; there are three in the specimen, one is quite oval, one is chlithridiate, and the other has a small projection or denticle on each side. The edge broken away on the right hand side shows that there are 4 "communication pores" on the lateral walls of the zooecia.

Membranipora regularis, n. sp. (Pl. XXIV., Fig. 10).

Zoarium cylindrical. Zooecia elongated hexagonal, quincuncially arranged, about six in lateral series; margins raised, smooth; area sloping downwards, granular; opesia oval, small, depressed, situated near the distal end.

Localities.—Mitchell River (J. Dennant); Aire Coastal Beds (Messrs. Hall and Pritchard).

There were a few not very well preserved specimens in the Mitchell River deposit, but it is very plentiful in the Aire Coastal Beds deposit, and in a very perfect state of preservation. The zooecia are remarkable for being very regular in shape. The zoarium occasionally breaks up longitudinally, with two or three zooecia in single series, the sides and back are thus exposed, and show four "communication pores" on the lateral walls; the cross section is triangular, and on the internal angle are the curious processes shown in figure "*a*," which look like small chambers, two (or a double one) on the distal and one on the proximal half.

Membranipora porcellana, n. sp. (Pl. XXIV., Fig. 11).

Zoarium unilaminate, but folded. Zooecia indistinct; opesia oval and circular, with narrow raised smooth margins; surface smooth porcellaneous. Avicularia hour-glass shaped, vicarious.

Locality.—Clifton Bank, Muddy Creek (T. S. Hall).

This is a very distinct form. The zoarium is unilaminate, apparently cylindrical, but it is coiled round an imaginary axis; the opesia of the inner coil can be seen through those of the outer one. The zooecia are undefined, and the opesia occupy almost the whole of the area. The avicularia are hour-glass shaped and vicarious.

Amphiblestrum planulatum, n. sp. (Pl. XXIV., Fig. 12).

Zoarium bilaminate, ligulate. Zooecia elongated, distal portion oval, proximal quadrangular, with a narrow raised border; opesia oval, with finely granulated raised margins. Avicularia, two below opesia, one above, occasionally one or two others on the quadrangular area. Ooecia galeate, with flattened area in front.

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

This is very plentiful in the deposit, and varies considerably in the shape of the zooecia, owing to the flat quadrangular area being in some cases reduced to a very small space.

Amphiblestrum variabile, n. sp. (Pl. XXIV., Fig. 13).

Zoarium encrusting. Zooecia irregularly disposed, oval or pyriform, surface smooth; opesia oval, occupying nearly two-thirds of the area, surrounded by a row of about 20 spines. A small avicularium below, immersed, with oval transverse mandible. Ooecium (?) irregular in shape, with an irregular opening.

Locality.—Lower beds, Muddy Creek (J. Dennant).

This species somewhat resembles *Membranipora geminata*, Waters, but the extension of the zooecia below the opesia and the avicularium show it to be different. I take the irregular cell with the elongated opening to be an ooecium, as it differs from the zooecia in the margin being smooth, without any spines, and it has no avicularium.

Amphiblestrum sexspinosum, n. sp. (Pl. XXIV., Fig. 14).

Zoarium cylindrical. Zooecia quincuncial, four in lateral series, pyriform, surface finely granulated; opesia large, oval, occupying half the length of the zooecia, margin raised, with three large, blunt spines on each side; proximal area narrow, with slightly elevated margin. Avicularia situated close to proximal margin of opesia, edges raised, proximal more than distal, with transverse subspatulate mandible opening upwards. Ooecium galeate, raised, granular.

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

This is very numerous in the deposit, but on only one specimen (Fig. 14*a*) was there an ooecium, and the form of the avicularia are better seen in it than in the other specimen figured.

Amphiblestrum ovatum, n. sp. (Pl. XXIV., Fig. 15).

Zoarium cylindrical. Zooecia quincuncial, six in lateral series, spatulate in shape, surface smooth; area elliptical, with highly raised margins; opesia oval.

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

This species is remarkable for the very regular elliptical area and smooth porcellaneous surface.

Amphiblestrum moniliferum, n. sp. (Pl. XXIV., Fig. 16).

Zoarium encrusting. Zooecia elongated, oval; surface granular; opesia occupying three-fourths of area, oval, with rather rugose raised margins bearing about fifteen blunt spines which are connected with each other by a narrow raised ridge that expands and surrounds the base of each spine. Avicularia vicarious, nearly as large as a zooecium, with long, acute, slightly curved mandible.

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

The large vicarious avicularia and the connecting ridge between the spines are very distinctive.

Amphiblestrum nitidum, n. sp. (Pl. XXIV., Fig. 17).

Zoarium cylindrical. Zooecia oval, quincuncially arranged, six or eight in lateral series; opesia oval or subtriangular, with

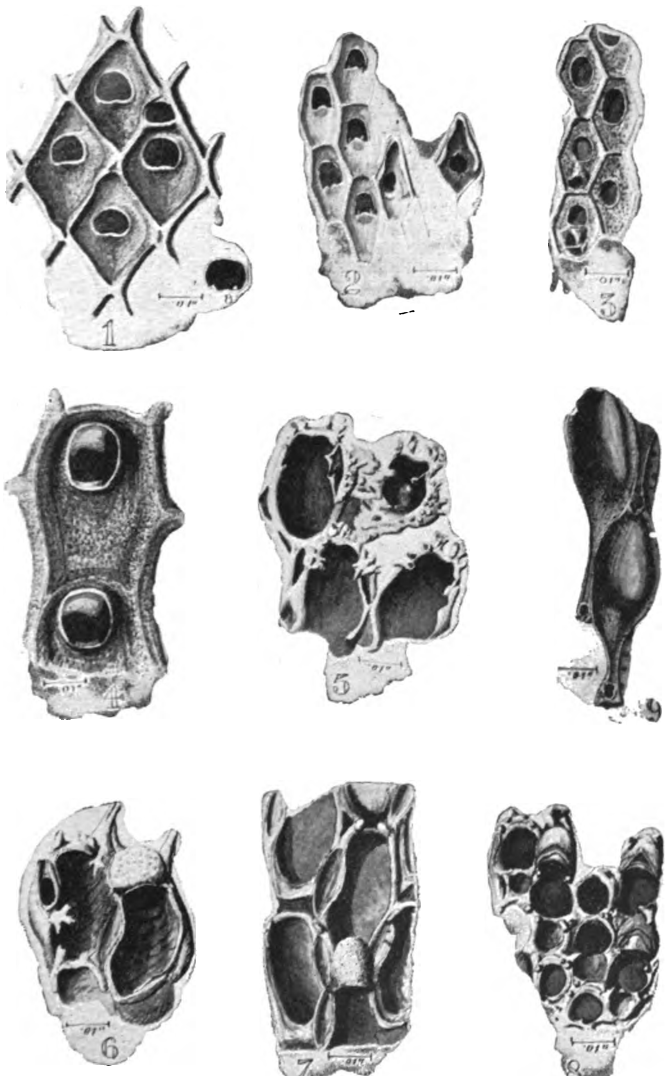
raised margins, sloping inwards. Ooecia galeate, smooth, with slight radiating lines on the face.

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

The ooecium on the right hand lower part of the figure shows a separate aperture; in the others this part has broken away.

DESCRIPTION OF PLATES XXIII. AND XXIV.

Fig. 1. Cellaria grandis.
„ 2. Cellaria contigua (var. corioensis).
„ 3. Melicerita elliptica
„ 4. Cellaria gigantea.
„ 5. Membranipora bellis.
„ 6. Membranipora globulosa.
„ 7. Membranipora radicifera.
„ 8. Membranipora aviculifera.
„ 9. Membranipora longipes.
„ 10. Membranipora regularis ("*a*," side view).
„ 11. Membranipora porcellana.
„ 12. Amphiblestrum planulatum ("*a*," ooecium).
„ 13. Amphiblestrum variabile.
„ 14. Amphiblestrum sexspinosum.
„ 14*a*. Amphiblestrum sexspinosum (with ooecium).
„ 15. Amphiblestrum ovatum.
„ 16. Amphiblestrum moniliferum.
„ 17. Amphiblestrum nitidum.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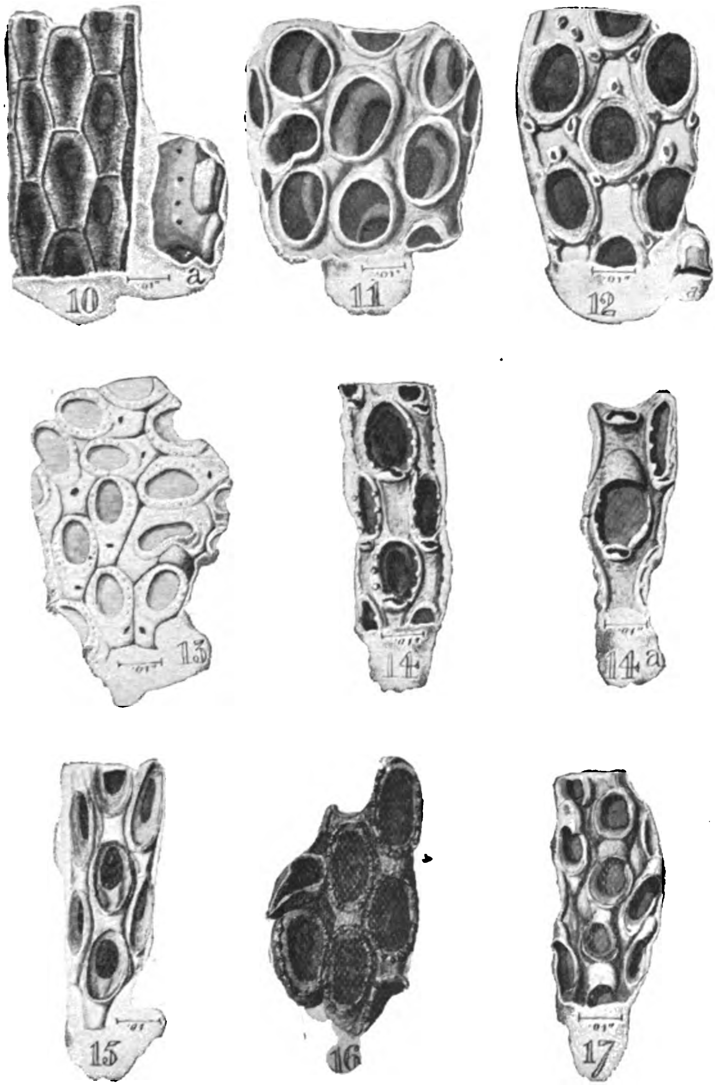
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ART. XIII.—*Australian Aboriginal Stone Implements. A suggested Classification.*

BY A. S. KENYON AND D. L. STIRLING.

(With Plates XXV–XXXIII).

[Read 4th October, 1900.]

(Communicated by Professor Baldwin Spencer).

It appears hardly necessary to enlarge on the need for a classification of the stone implements of the Australian Aboriginal. All investigators, as well as collectors, have experienced difficulties through such want. The subject of these stone implements, and their uses is one to which little attention has been paid by writers on the Ethnology of the Australian Aboriginal; R. Brough Smyth in "The Aborigines of Victoria" has dealt with the subject in some detail; but his remarks, being confined only to descriptions of the implements coming under his notice, do not include amongst others, any of the very interesting series of chipped implements of palæolithic type occurring commonly in Victoria. In general, authors, save for cursory remarks as to use of other stone implements, have confined their attention to the ground cutting edged implements, generally known as "Blackfellow's axes or tomahawks." These tools are so easily recognisable that they are readily picked up by others than collectors, and are to be found in number in all collections. Other stone implements, even when so distinctive in shape as grinding mills or sharpening stones, are not so easily recognised by the non-collector, and they are contained in few collections. The less distinctive implements have not been described, and when occurring in collections, are frequently wrongly labelled. A further reason for the undue preponderance of axes or tomahawks in collections is that they are found scattered over the whole country, while almost all the other implements are found at the sites of camps only, being chiefly used in domestic operations.

Mr. Smyth[1] divided the stone implements used by the natives into eleven groups, which were:—

a. Hatchets.
b. Knives.
c. Adzes.
d. Chips of basalt for jagged spears.
e. Chips of basalt for cutting and scraping skins of animals, etc.
f. Stones for pounding roots, seeds, etc.
g. Stones for sharpening spears and hatchets.
h. Stones for fishing.
i. Stones used by women in making baskets.
j. Stones from which ruddle, etc., are obtained.
k. Sacred stones kept by priests and others.

This arrangement does not include "throwing" or "game" stones; and includes, in groups *j* and *k*, ruddle stones, and sacred stones which are hardly properly classed under the term implement. If, as it appears was the intention, the groups were to show all the uses of stone by the aboriginals, building and fire stones should also have been included.

Mr. R. Etheridge, Junr.,[2] commenced a tentative classification of the ground cutting edged implements; but, unfortunately, he has not carried out his expressed intention of completing this work,[3] and it is understood that he has abandoned the project.

The writers, in the course of their work in collecting stone implements in Victoria, found it imperative to make a classification of them, and, with a view to eliciting criticisms or suggestions for improvement, now submit this classification to members interested. It is one which they believe will prove of use to the collector, and serve as a guide to investigators. To some of the groups are attributed uses differing from those given by other writers, and some of them have been hitherto unrecognised and undescribed.

Unfortunately, the methods of employment of many of the groups are not known with any degree of certainty; particularly so as regards the stone implements of the aboriginals formerly

1 Aborigines of Victoria, vol. i., p. 358.
2 Proc. Linn. Soc. N.S.W., vol. vi., pt. 3, 1891, p. 357.
3 Mem. Geol. Surv. N. S. Wales; Pal. No. 8, pt. i., p. i., 1890.

inhabiting South Eastern Australia and Tasmania. The classification suggested has, therefore, not been entirely based on methods of use, a system which would appear to be the most satisfactory; but is, in some cases, dependent upon the apparent mode of preparation or manufacture.

The first step in classification has been to group together all the different implements having distinctive uses. The first group and the most important is that of cutting implements. Next in order come the groups of grinding and pounding implements. Of lesser importance are fishing stones, throwing stones, game stones and basket stones. A distinct group may be required for those implements, the use of which is not definitely known and can hardly at present be conjectured, such as the carrot-shaped stones from the Darling River District, Victoria, etc.

Ceremonial or sacred stones are not considered to come properly under the term implements, and, for like reason, building, fire, and pigment stones are excluded.

The first group of cutting implements, distinguished by C., separate easily into two divisions—A. those having the cutting edge produced by flaking or chipping; B., those having the cutting edge produced by grinding and polishing. The division C. A., is arranged in seven subdivisions, bearing as titles the names of the European tools most nearly representing the uses to which the implements would be put. They are:—I. Axes, II. Rasps, III. Knives, IV. Adzes, V. Scrapers, VI. Spearheads, and VII. Nuclei or Cores. The last is not strictly a proper subdivision; but it is necessary for the classification of a collection of flaked or chipped edged implements. Subdivision C. A. I., flaked or chipped edge axes, forms two sections, *a.* those having a chipped edge, and *b.* those having a flaked edge. The section C. A. I. *b.* is not further subdivided, there being only one class known, which is the flaked axe, hafted, with a head larger than, but otherwise closely resembling the hafted knives of Central Australia. The section C. A. I. *a.* is subdivided into two classes—1. those chipped on one side only of the cutting edge, and 2. those chipped on both sides. Classes C. A. I. *a.* 1. has two sub-classes, *α.* those with an acute and *β.* those with an obtuse bevel. Neither of these sub-classes have apparently been hafted, being for hand use only. The Tasmanian axes belong to the first sub-class, C. A. I. *a.* 1. *α.*

The class C. A. I. *a*. 2, axes chipped on both sides, has also two sub-classes; *a*. those hafted, comprising the West Australian examples, and *β*. those not hafted. The subdivision C. A. II., Rasps, includes implements which have a concave cutting or scraping edge, used for scraping hafts of spears, waddies, etc., and is not further divided.

The subdivision C. A., III., knives, separates easily into two sections, *a*. those hafted and *b*. those not hafted. The section C. A., III., *a*. has two classes: 1. single flake, and 2. multiple flake. The class C. A., III., *a*. 1., forms two sub-classes, *a*. chipped and *β*. flaked. These sub-classes comprise the hafted knives of Central Australia. The class C. A., III., *a*. 2., multiple flake, comprises those knives formed by the placing of a number of small flakes in a setting of gum on a wooden haft; and is not further divided.

The Section C. A., III., *b*. knives not hafted, is subdivided into two classes—1. chipped, and 2 flaked. These classes comprise the Tasmanian knives and many examples from the mainland.

The subdivision C. A., IV., adzes comprises the very fine examples from Central Australia, and the smaller ones from South Eastern Australia, which were generally hafted, and from Tasmania, which were not.

The subdivision C. A., V., scrapers includes a large number of chipped-edged implements, which do not come under the headings of axes or knives; but which, in their limits, approach both of those sub-divisions. Their use is undoubtedly for scraping wooden implements, skins, etc. The sub-division C. A., VI., spearheads, forms to sections *a*. single flake and *b*. multiple flake. The Section C. A., VI., *a*. is subdivided into three classes —1. chipped, 2. flaked and 3. serrated. Classes 1. and 2. resemble one another; but are sufficiently distinct to justify their separation. Class 3. comprises the finest examples of Australian chipping work and, in the form of glass spearheads, are well known.

Section C. A., VI, *b*. multiple flake, resemble the class, C. A., III, *a*. 2. multiple flake knives; but are set in 1, 2, 3 or 4 rows on the spearhead.

The subdivision C. A. VII., as already mentioned, is for purposes of classification of collections only.

The division C. B., cutting implements with edge produced by grinding or polishing, includes four subdivisions:—I. Axes; II. Wedges; III. Knives or Scrapers, and IV. Blanks. The last class axes, etc., in the rough, is simply for collection classification.

As before, the nomenclature, as nearly as possible, gives the uses of these implements as compared with European tools.

The subdivision C. B. I. axes, forms two sections: *a.* those grooved for hafting, and *b.* those not grooved for hafting. This separation, though convenient, is not altogether satisfactory, as the title "not grooved for hafting" may imply that these axes were generally hafted. As a matter of fact, it may be agreed that the majority were never used with a haft while those hafted were also frequently used in the hand without the haft. The section C. B. I. *a.* is not further subdivided. The examples at present available are not numerous; it will, however, probably be found necessary to make further subdivisions here.

The section C. B. I. *b.* is divided into six classes: 1. oblong ovate; 2. ovate; 3. deltoid; 4. gad-shaped; 5. adze-shaped; and 6. cone-shaped. The classification is based generally on the shape of the bodies. Class C. B. I. *b.* 1. is divided into four sub-classes, depending upon the nature of the cutting edge. α. straight edge; β. circular edge; γ. parabolic cutting edge; and δ. with the edge not in, but inclined to, the plane of the major axis of the cross section of the body. Sub-class C. B. I. *b.* 1. γ. occurs frequently in the Goulburn Valley, Victoria, and C. B. I. *b.* 1. δ. commonly in the Western District of Victoria; they appear to merit separate classification. The class C. B. I. *b.* 1. comprises over 80 per cent. of the examples known to the writers and the sub-class β., circular cutting edge, forms 90 per cent of that class.

Class C. B. I. *b.* 2., ovate, is not the same as proposed by Mr. Etheridge,[1] judging from the examples figured. His class is included by the writers in the "oblong-ovate" C. B. I. *b.* 1. The axes now included in the ovate class are distinctly ovate both in plan and in cross section. They may possibly be referable to the subdivision, wedges; but the absence of grooves and flattened butt ends, and the excellence of the cutting edges place them preferably in the subdivision "axes."

1 Proc. Linn. Soc., vol. vi., pt. 3, 1891, p. 358.

The class C. B. I. *b.* 3., deltoid, is the same as that of Mr. Etheridge. The type examples of this class come from N.W. Australia, examples from other parts being apparently accidental, and due, probably, to shape of the pebble used.

Class C. B. I. *b.* 4., gad-shaped, is very distinct; it is divided into two sub-classes, *a.* cylindrical, and *β.* flattened body.

The examples of sub-class *a.* are all, as far as known, from the Goulburn Valley, Victoria; the sub-class *β.* occur numerously in Gippsland, New South Wales and Queensland.

Class C. B. I. *b.* 5., adze-shaped, would appear to be doubtful, were it not for the very distinct specimens illustrated by Mr. Etheridge, and for one example in the National Museum, Melbourne. They resemble strongly South Sea implements, and show more specialization than any others described.

Class C. B. I. *b.* 6., cone-shaped, is very definite, the only examples known to the writers coming from the Goulburn Valley, Victoria.

Subdivision C. B. 2., wedges, comprises implements of axe-shape, and of large size. They are generally of inferior stone, and do not have well polished cutting edges. Almost all the examples known are grooved for hafts or holding-withies. The different styles of grooving cause them to be divided into four sections:—*a.* With a single transverse groove (the common type); *b.* double transverse groove (rare); *c.* with a longitudinal groove extending from the transverse groove around the butt, evidently intended for firmer attachment of the haft; and *d.* without a groove.

Subdivision C. B. III., knives or scrapers, comprises the small axe-shaped implements, often called "toy tomahawks." Their use is for carving and particularly for scraping and dressing skins for rugs. Although they have distinctive variations in shape and method of preparation, they do not occur in sufficient number to warrant further subdivision.

The second group, grinding implements, distinguished by **Gr.**, is separated into two divisions. A. Kerns or mills, for grinding foodstuffs and pigments, and B. Grinding stones, for fashioning and sharpening other implements.

The division **Gr.** A. forms six subdivisions:—I. Nether stones with husking hole on the lower side, and a spherical hollow; II. Nether stones without the husking hole, and with a spherical

TABLE.

dinal groove
d. not grooved

III. Knives or Scrapers

IV. (Blanks)

Gr. Grinding Implements

A. Kerns or Mills

I. Nether stones with husking hole, spherical hollow
II. ,, ,, without ,, ,, ,, ,,
III. ,, ,, ,, ,, ,, plane surface
IV. ,, ,, ,, ,, ,, oval hollow
V. ,, (and upper) stones, circular, also used for pounding fibre
VI. Upper stones
a. spheroidal
b. pestle shaped
c. muller shaped

B. Grinding Stones

I. Grind Stones
II. Whet Stones
III. Rasps

P. Pounding Implements

A. Hammers
B. Chipping Hammers
C. Fibre Pounders
D. Anvil Stones

F. Fishing Stones

T. Throwing Stones

Ga. Game Stones

hollow; III. Nether stones without the husking hole, and having a plane surface; IV. Nether stones without the husking hole, and with an oval hollow; V. Nether stones, generally circular, and probably used occasionally as upper stones, and also for pounding fibre; VI. Upper stones, divided into three sections, *a.* Spheroidal, used with subdivisions I. and II.; *b.* Pestle-shaped, belonging to subdivision II.; and *c.* Muller-shaped, belonging to subdivisions III. and IV.

The division Gr. B., has three subdivisions:—I. Grinding stones for putting cutting edges on blanks and for sharpening axes. II. For whetting or sharpening the edge of axes in use, and III. Rasps for dressing hafts of spears, waddies, etc.

The group, Pounding Implements, distinguished by the letter P. has four subdivisions:—A. Hammers of various sizes from quarrying hammers used with two hands, down to small ones for flaking blank axes or striking chips from nuclei. B. Chipping hammers for secondary chipping of knives, adzes, etc. C. Pounders for separation of fibre, and D. Anvil stones, the use of which is not definitely known, but which occur in great number in some localities. The remaining groups are sufficiently explained by their titles.

The whole classification is set forth in the attached table.

EXPLANATION OF PLATES XXV.–XXXIII.

Plate XXV.

Fig. 1.—C. A. I. *a.* 1. *a.* Axe, chipped one side only to an acute bevel:—*a.* edge view; *b.* side view. Limestone. Barwon Heads, Vic. Scale, one-half.

Fig. 2.—C. A. I. *a.* 1. *β.* Axe, chipped one side only to an obtuse level:—*a.* edge view; *b.* side view. Metamorphic. Essendon, Vic. Scale, one-half.

Fig. 3.—C. A. I. *a.* 2. *β.* Axe, chipped both sides. *a.* edge view; *b.* side view. Quartzite. Barwon Heads, Vic. Scale, one-half.

Plate XXVI.

Fig. 1.—C. A. II. Rasp, for boomerangs and spear-hafts. Lake Lonsdale, Vic. Metamorphic. Scale, one-half.

Fig. 2.—C. A. III. *a*. 1. *β*. Hafted single flake Knife. Central Australia. Quartzite. Scale, one-half.

Fig. 3.—C. A. III. *a*. 2. Hafted multiple flake Knife. Quartz chips. Western Australia. Scale, one-half.

Fig. 4.—C. A. V. Scraper. Metamorphic. Lake Lonsdale, Victoria. Scale, one-half.

Fig. 5.—C. A. V. Scraper. Flint. Belfast, Vic. Scale, one-half.

Fig. 6.—C. A. V. Scraper. Chert. Huon R., Tas. Scale, one-half.

Plate XXVII.

Fig. 1.—C. A. III. *b*. 2. Flaked Knife, not hafted. Lorne, Vic. Flint. Scale, three-quarters.

Fig. 2.—C. A. III. *b*. 2. Flaked Knife, not hafted. Huon R., Tas. Quartzite. Scale, three-quarters.

Fig. 3.—C. A. III. *b*. 2. Flaked Knife, not hafted. Gisborne, Vic. Quartzite. Scale, three-quarters.

Fig. 4.—C. A. III. *b*. 2. Flaked Knife, not hafted. St. Kilda, Vic. Quartzite. Scale, three-quarters.

Fig. 5.—C. A. III. *b*. 1. Chipped Knife, not hafted. Lake Narraport, Vic. Flint. Scale, three-quarters.

Fig. 6.—C. A. III. *b*. 1. Chipped Knife, not hafted. St. Kilda, Vic. Quartzite. Scale, three-quarters.

Fig. 7.—C. A. IV. Adze. Werribee, Vic. Quartzite. Scale, three-quarters.

Fig. 8.—C. A. IV. Adze. Panyyabyr, Vic. Flint. Scale, three-quarters.

Fig. 9.—C. A. IV. Adze. Barwon Heads, Vic. Dense Basalt. Scale, three-quarters

Fig. 10.—C. A. III. *b*. 1. Chipped Knife, not hafted. Huon R., Tas. Chert. Scale, three-quarters.

Fig. 11.—C. A. III. *b*. 1. Chipped Knife, not hafted. Lake Lonsdale, Vic. Quartzite. Scale, three-quarters.

Fig. 12.—C. A. IV. Adze. D'Entrecasteaux R., Tas. Quartzite. Scale, three-quarters.

Plate XXVIII.

Fig. 1.—C. B. I. *b*. 1. *a*. Oblong-ovate Axe, straight cutting edge. Metamorphic. Tibbooburra, N.S.W. Scale, one-half.

Fig. 2.—C. B. I. *b*. 1. *β*. Oblong-ovate Axe, circular cutting edge. Diorite :—*a*. side view ; *b*. edge view. Cossack, W.A. Scale, one-half.

Fig. 3.—C. B. I. *b*. 1. *γ*. Oblong-ovate Axe, parabolic cutting edge. Felsite : —*a*. side view ; *b*. edge view. Charlton, Vic. Scale, one-half.

Fig. 4.—C. B. I. *b*. 1. *δ*. Oblong-ovate Axe, with cutting edge inclined to plane of major axis. Metamorphic :—*a*. side view ; *b*. edge view. Horsham, Vic. Scale, one-half.

Plate XXIX.

Fig. 1.—C. B. I. *b*. 2. Ovate Axe. Basalt :—*a*. side view ; *b*. edge view. Hamilton, Vic. Scale, one-half.

Fig. 2.—C. B. I. *b*. 4. *β*. Gad-shaped Axe, with flattened body. Porphyry :—*a*. side view ; *b*. edge view. Tambo R. Vic. Scale, one-half.

Plate, XXX.

Fig. 1.—C. B. I. *b*. 3. Deltoid Axe. Diorite :—*a*. side view ; *b*. edge view. Kimberley, W.A. Scale, one-half.

Fig. 2.—C. B. I. *b*. 4. *a*. Cylindrical gad-shaped Axe. Metamorphic :—*a*. side view ; *b*. edge view. Elmore, Vic. Scale, one-half.

Fig. 3.—C. B. I. *b*. 6. Cone-shaped Axe. Metamorphic :—*a*. side view ; *b*. edge view. Rushworth, Vic. Scale, one-half.

Fig. 4.—C. B. III. Scraper. Metamorphic. Tooleybuc, N.S.W. Scale, one-half.

Fig. 5.—C. B. III. Scraper. Metamorphic. Rushworth, Vic. Scale one-half.

Fig. 6.—C. B. III. Knife. Metamorphic. Rushworth, Vic. Scale, one-half.

Plate XXXI.

Fig. 1.—C. B. II. *a.* Wedge, with transverse groove. Basalt. *a.* side view; *b.* edge view. Hamilton, Vic. Scale, one-half.

Fig. 2.—C. B. II. *b.* Wedge, with double transverse groove. Hamilton, Vic. Scale, one-half.

Plate XXXII.

Fig. 1.—C. B. II. *c.* Wedge, with transverse and semi-longitudinal groove. Diabase:—*a.* side view; *b.* edge view. Rushworth, Vic. Scale, one-half.

Fig. 2.—C. B. II. *d.* Wedge, not grooved. Basalt. Lake Lonsdale, Vic. Scale, one-half.

Plate XXXIII.

Fig. 1.—C. B. II. *d.* Edge view of Wedge. Fig. 2. Plate XXXII.

Fig. 2.—C. B. II. *b.* Edge view of Wedge. Fig. 2. Plate XXXI.

Fig. 3.—C. A. VI. *a.* 1. Spearhead, single flake with chipped edge. Quartzite. Northern Territory. Scale, one-half.

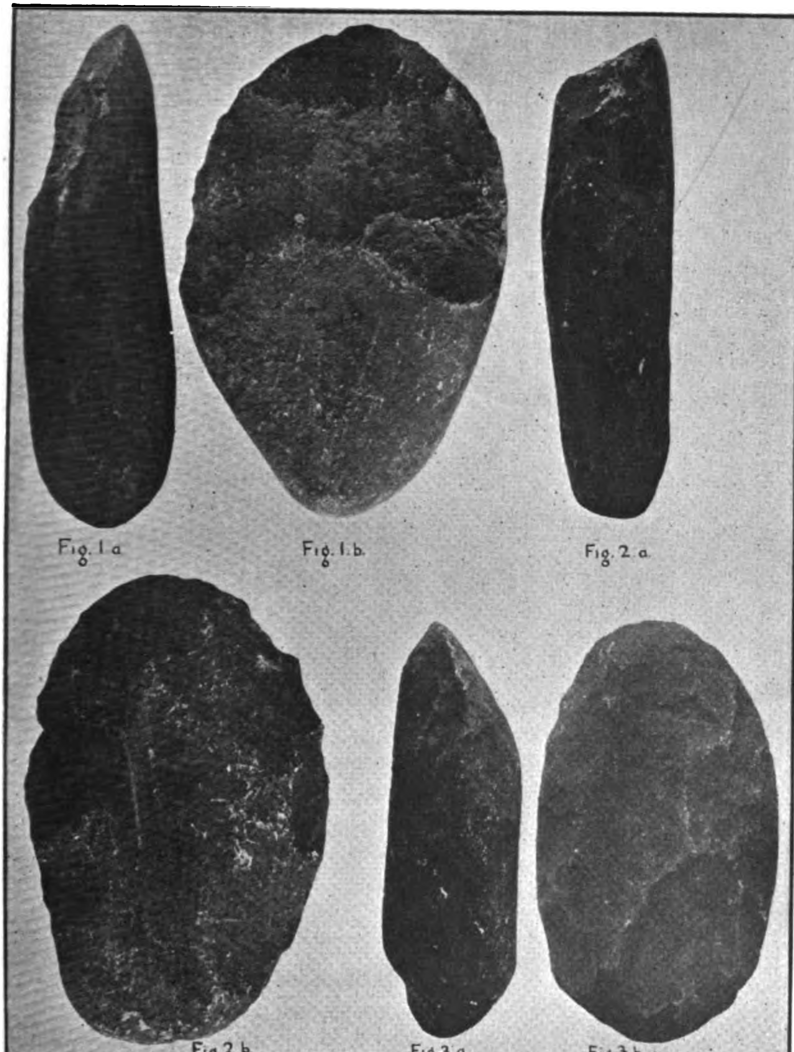
Fig. 4.—C. A. VI. *a.* 3. Spearhead, serrated. Glass. Cossack, W.A. Scale, one-half.

Fig. 5.—C. A. VI. *a.* 3. Spearhead, serrated. Quartzite. Central Australia. Scale, one-half.

Fig. 6.—C. A. VI. *a.* 3. Spearhead, serrated. Glass. Kimberley, W.A. Scale, one-half,

Fig. 7.—CA. VI. *a.* 3. Spearhead, serrated. Chalcedony. Cossack, W.A. Scale, one-half

Fig. 8.—C. A. VI. *a.* 3. Spearhead, serrated. Glass. Kimberley, W.A. Scale, one-half.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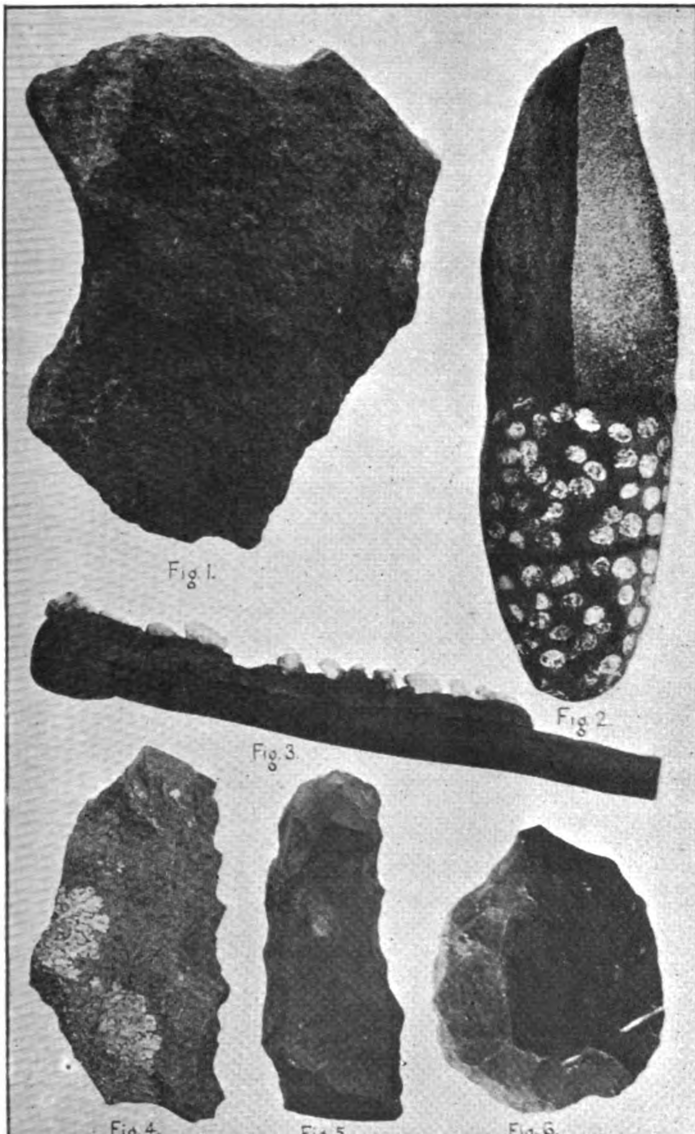
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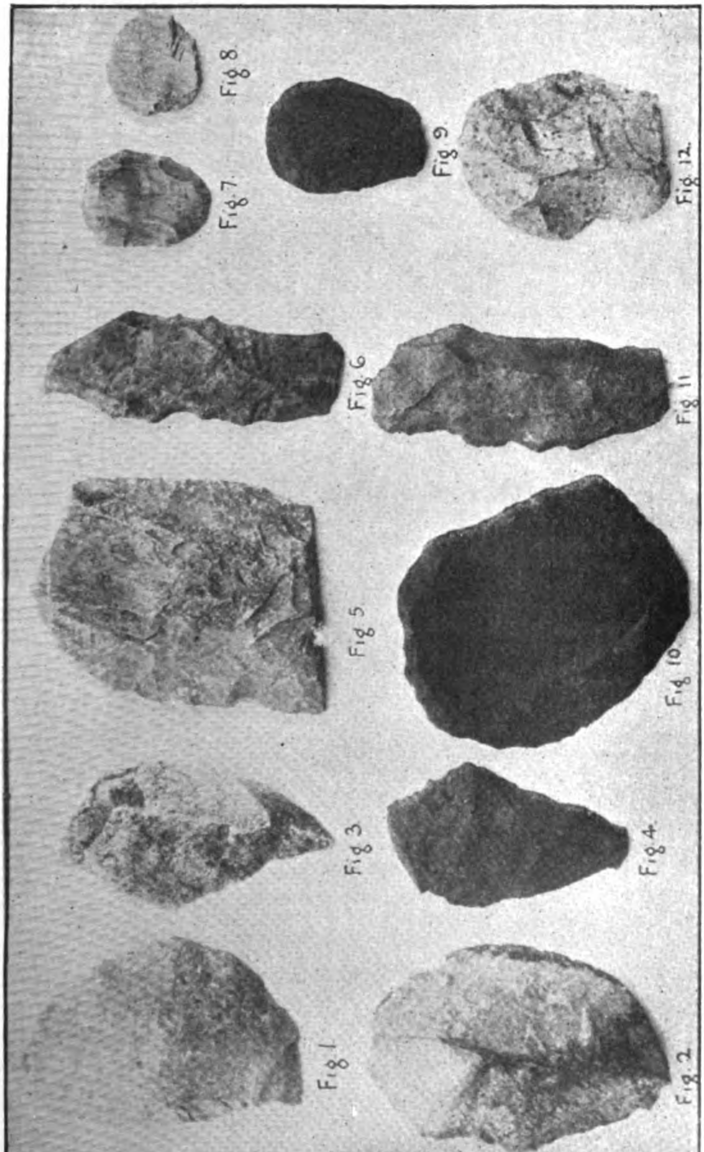
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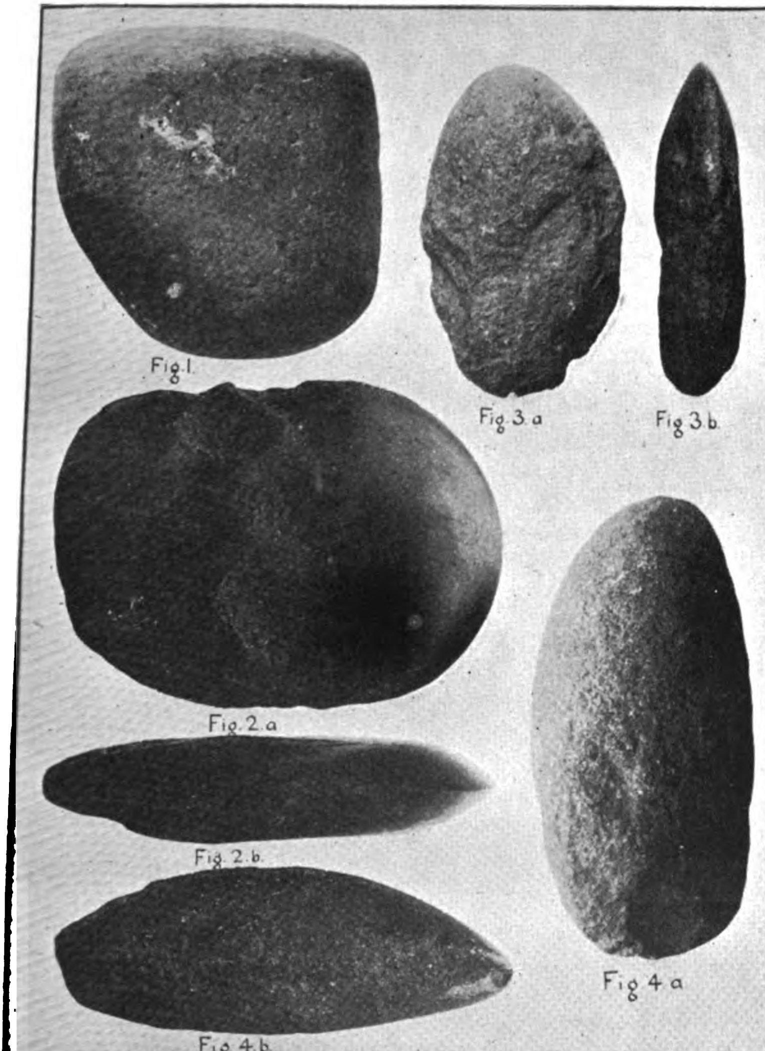

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Fig. 2. b.
Fig. 4 a
Fig. 4. b.

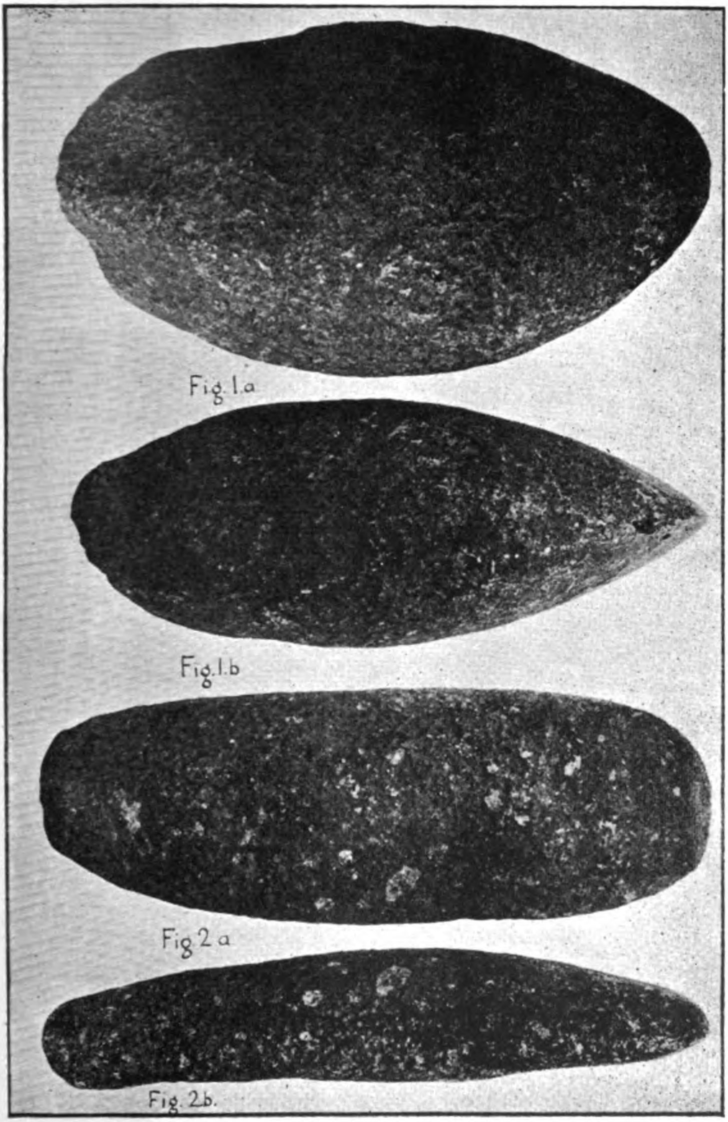
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Fig. 1.b
Fig. 2 a
Fig. 2b.

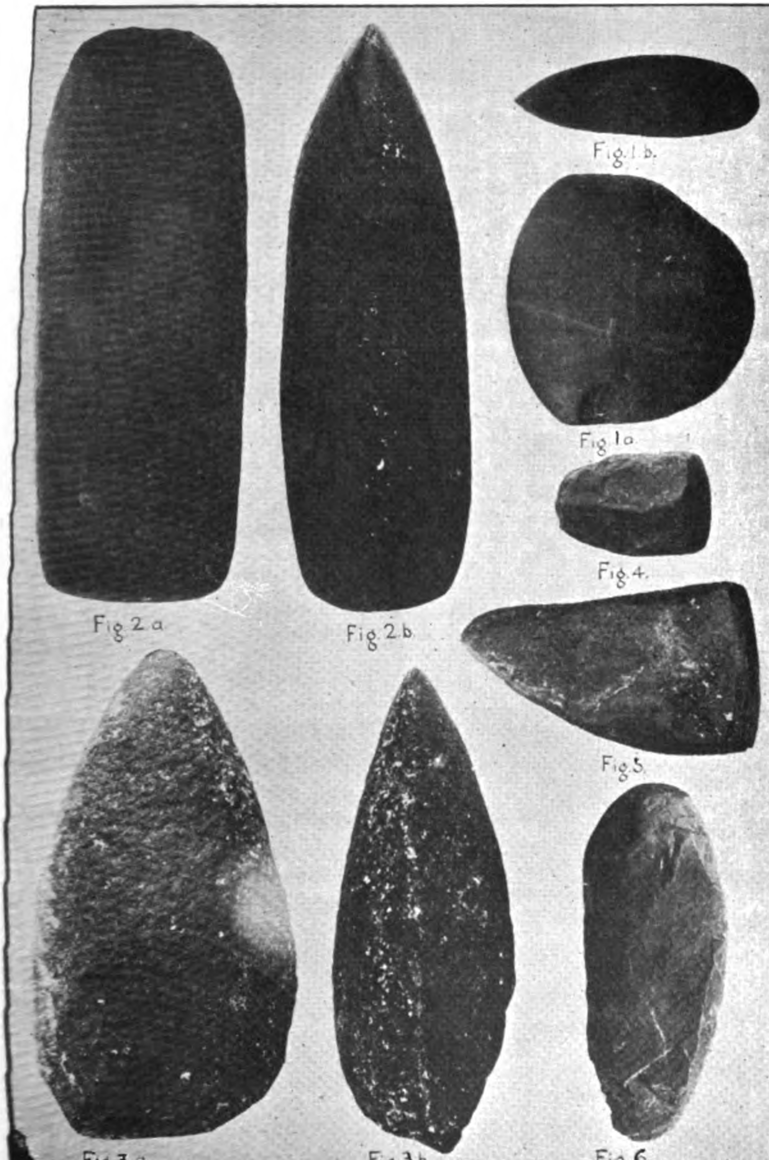
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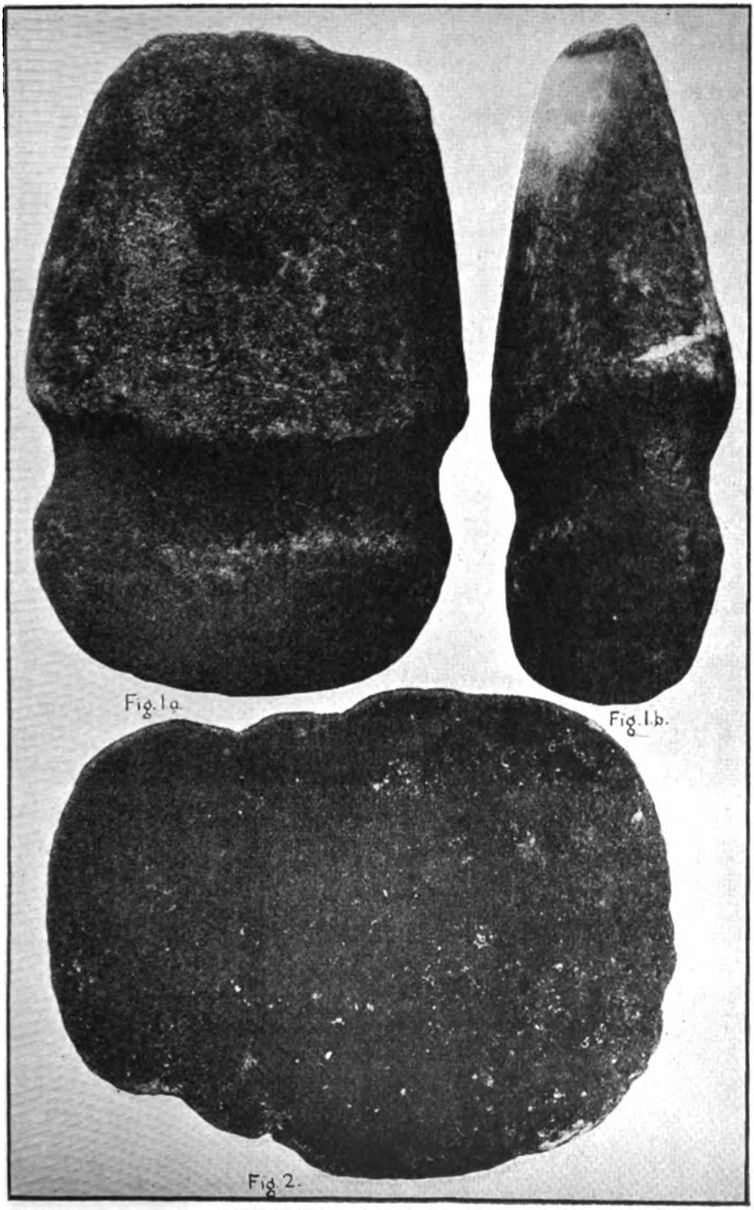
Fig. 2 a.
Fig. 2 b.
Fig. 5.
Fig. 3 a.
Fig. 3 b.
Fig. 6.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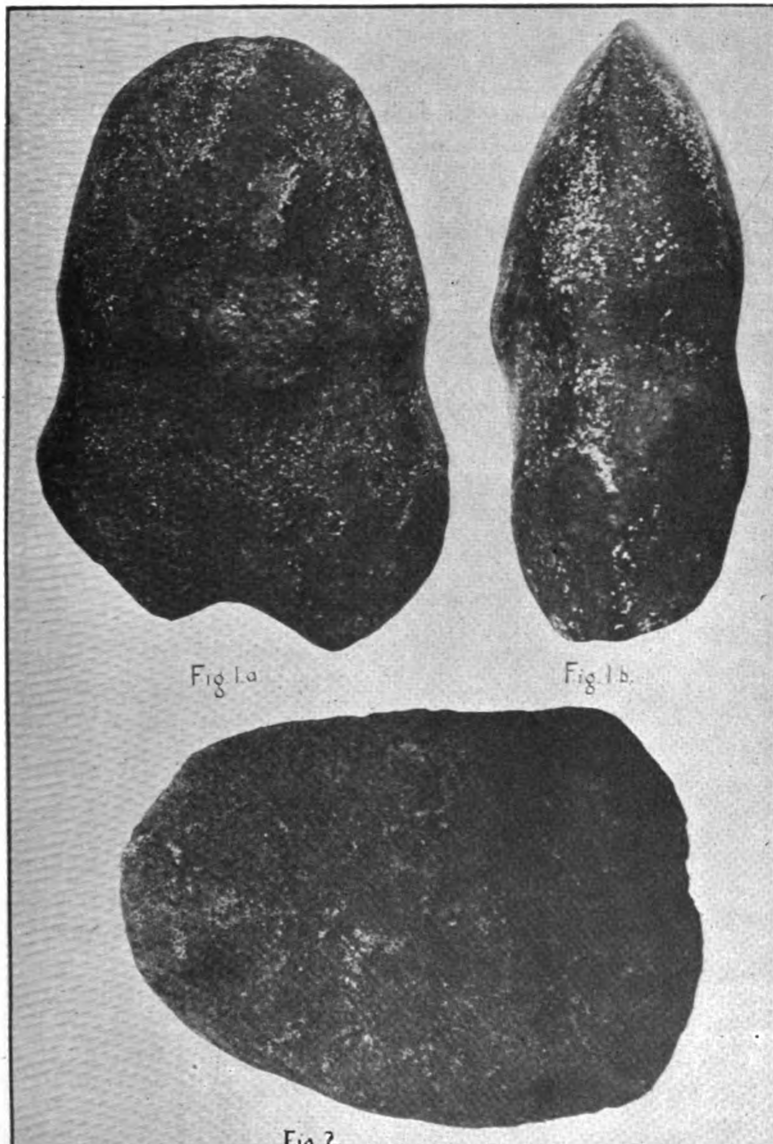

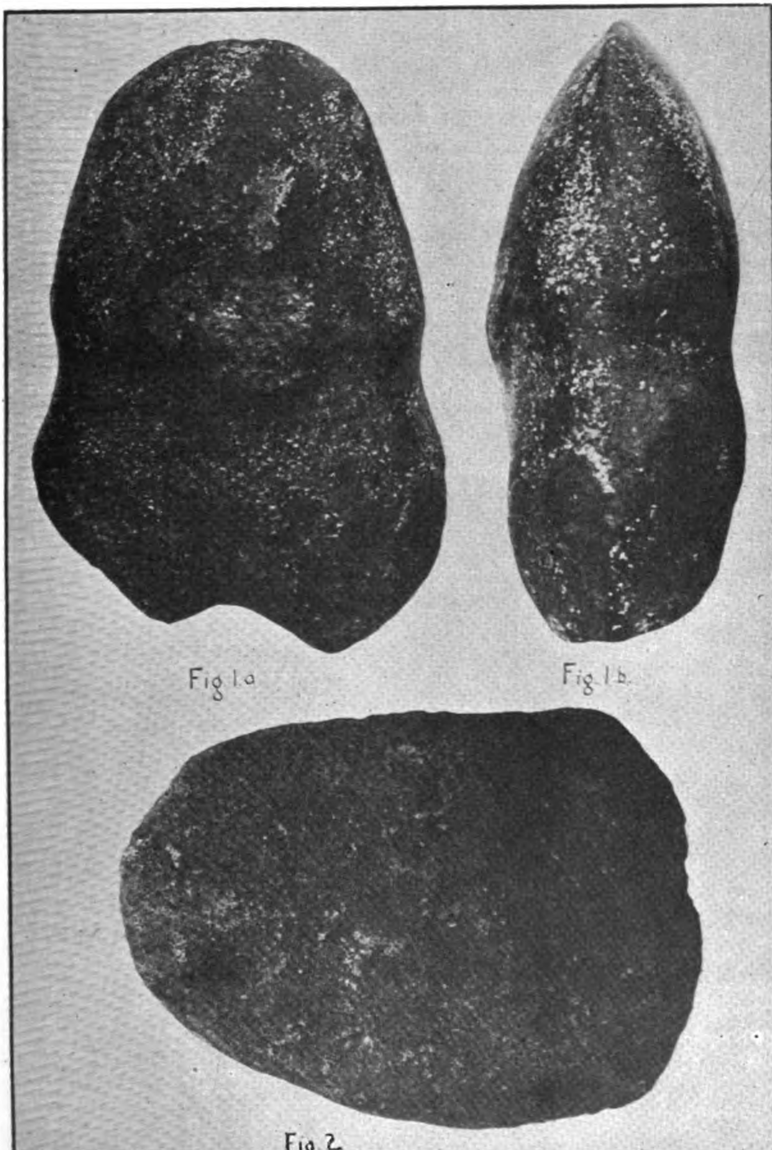
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Fig 2.

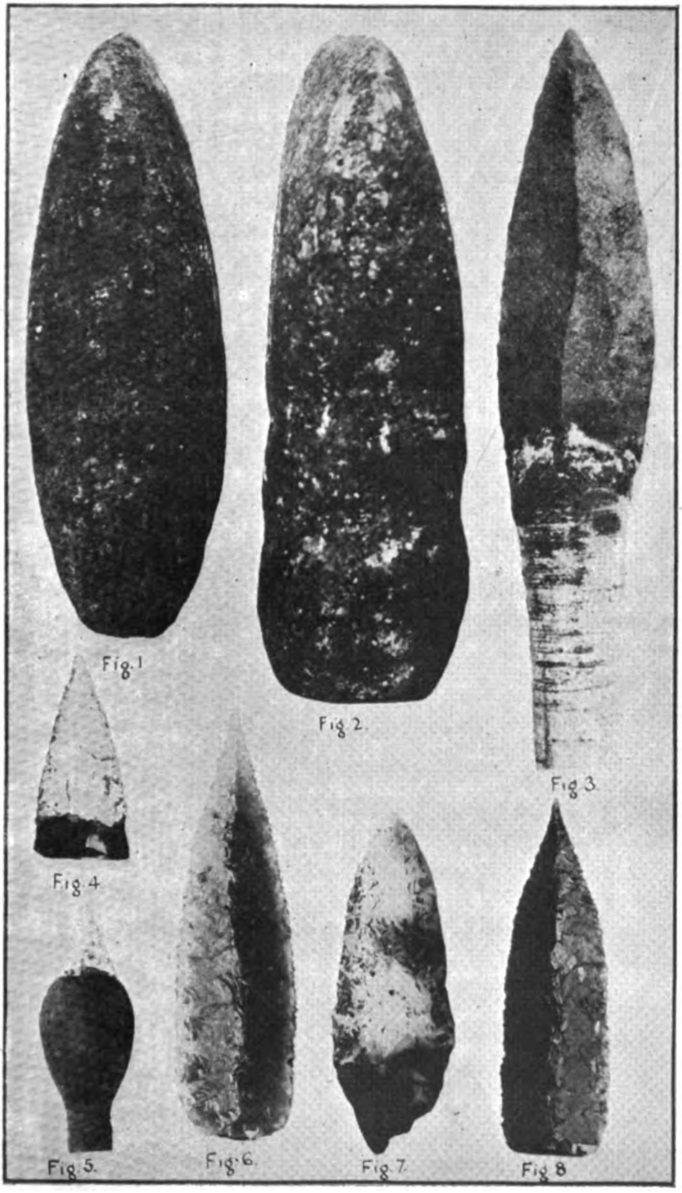
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Fig. 2.
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Fig. 8

Art. XIV.—*On a new name "Vittaticella," for the Polyzoan genus Caloporella, McG.*

By C. M. MAPLESTONE.

[Read 13th December, 1900].

A new name is necessary for Dr. MacGillivray's genus *Caloporella* (of the family Catenicellidae), as Ulrich had previously described a genus of Palaeozoic Polyzoa under the name of *Calloporella;* the difference in the spelling of these two names being so slight, two *ls* in the one and one *l* in the other, and the derivation and pronunciation of the words being the same they are practically the same word, so that I consider Dr. MacGillivray's name cannot stand.

Calloporella was described by Ulrich in 1882, in a paper on the American Palaeozoic Bryozoa, published in the Journal of the Cincinnati (Ohio, U.S.A.) Society of Natural History, Vol. V., page 154. Dr. MacGillivray's genus was not described until 1895, and I propose the name "*Vittaticella*" for it, as the genus was founded for the reception of those forms of the original genus "*Catenicella*" which Busk separated as "*Vittatae*" in contradistinction to the "Fenestratae" and "Carinatae" divisions of the genus.

I am indebted to Mr. J. M. Nickles of Cincinnati, Ohio, U.S.A., for giving me information which enabled me to trace Ulrich's genus.

The following are the species affected by the change of name. :—

Vittaticella hannafordi (McG. sp.)

Caloporella hannafordi, Mc.G., T.R.S.V., vol. iv., 1895, p. 19.

Catenicella hannafordi, McG., P.Z.V., 24.

Vittaticella insignis (McG. sp.)

Caloporella insignis, McG., T.R.S.V., vol. iv., p. 18.

Vittaticella praetenuis (McG. sp.)

Caloporella praetenuis, McG., T.R.S.V., vol. iv., p. 20.

Vittaticella sacculata (Busk sp.)

Caloporella sacculata, Bk., T.R.S.V., vol. iv., p. 20.

Catenicella sacculata, Bk., C.P., pt. i., p. 12.

Vittaticella speciosa (McG. sp.)

Caloporella speciosa, McG., T.R.S.V., vol. iv., p. 19.

Vittaticella teres (McG. sp.)

Caloporella teres, McG., T.R.S.V., vol. iv., p. 19.

Vittaticella cordata (Map. sp.)

Caloporella cordata, Map., T.R.S.V., vol. xi., 1898, pt. i., p. 17.

Vittaticella dendrina (Map. sp.)

Caloporella dendrina, Map., T.R.S.V., vol. xi., pt. i., p. 17.

Vittaticella enormis (Map. sp.)

Caloporella enormis, Map., T.R.S.V., vol. xi., pt. i., p. 18.

Vittaticella grandis (Map. sp.)

Caloporella grandis, Map., T.R.S.V., vol. xi., pt. i., p. 16.

Vittaticella maculata (Map. sp.)

Caloporella maculata, Map., T.R.S.V., vol. xi., pt. i., p. 17.

Vattaticella rostrata (Map. sp.)

Caloporella rostrata, Map., T.R.S.V., vol. xi., pt. i., p. 18.

The above are all found fossil in the Victorian Tertiary formations. *V. hannafordi* is also a recent Australian species.

The following recent species of Catenicellae "Vittatae" enumerated in Dr. MacGillivray's "Catalogue of the Marine Polyzoa of Victoria," published in the transactions of this Society for 1886, are also affected by the change of name:—

Vittaticella formosa (Busk sp.)

Catenicella formosa, Busk, B.M.C., pt. i., p. 9.

Vittaticella perforata (Busk sp.)

Catenicella perforata, Busk, B.M.C., pt. i., p. 10.

Vittaticella gracilenta (McG. sp.)

Catenicella gracilenta, McG., T.R.S.V., Nov., 1884.

Vittaticella cornuta (Busk sp.)

Catenicella cornuta, Busk, B.M.C., pt. i., p. 11.

Vittaticella ringens (Busk sp.)
Catenicella ringens, Busk, B.M.C., pt. i., p. 10.

Vittaticella elegans (Busk sp.)
Catenicella elegans, Busk, B.M.C., pt. i., p. 10.

Vittaticella dawsoni (Wyv. Thomson sp.)
Catenicella dawsoni, Wyv. Thomson, Dub. Nat. Hist. Rev., 1858.

Vittaticella buskii (Wyv. Thomson sp.)
Catenicella buskii, Wyv. Thomson, Dub. Nat. Hist. Rev. 1858.

Vittaticella venusta (McG. sp.)
Catenicella venusta, McG., T.R.S.V., March, 1886.

Vittaticella fusca (McG. sp.)
Catenicella fusca, McG., P.Z.V., 90.

Vittaticella crystallina (Wyv. Thomson sp.)
Catenicella crystallina, Wyv. Thomson, Dub. Nat. Hist. Rev. 1858.

Vittaticella utriculus (McG. sp.)
Catenicella utriculus, McG., P.Z.V., 89.

Vittaticella umbonata (Busk sp.)
Catenicella umbonata, Busk, B.M.C., pt. i., p. 11.

Vittaticella delicatula (J. B. Wilson sp.)
Catenicella delicatula (J. B. W. sp.), Catalogue, p. 12.
Catenicellopsis delicatula (J. B. W. sp.), McG., P.Z.V., 107.
Catenicellopsis delicatula, J. B. Wilson, Tr. Mic. Soc. Vic., 1880.

Art. XV.—*Further Descriptions of the Tertiary Polyzoa of Victoria.—Part VI.*

By C. M. MAPLESTONE.

(With Plates XXXIV. and XXXV.).

[Read 13th December, 1900].

Membranipora ligulata, n. sp. (Pl. XXXIV., Fig. 1).

Zoarium erect, bilaminate, branching. Zooecia undefined, margins only indicated occasionally by a slight longitudinal furrow. Opesia oval, margins finely striated, raised above the surface of the zooecia. Small oval, raised avicularia, with triangular mandibular areas, scattered between the zooecia. Large vicarious avicularia on margins of zoaria, with a bar; mandible triangular, acute, pointing upwards; occasionally the bar is present with a semicircular cavity below, but more often the bar is broken away, making the opening appear pear-shaped (inverted).

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

This might be mistaken for *Hiantopora liversidgei*, on account of the large vicarious avicularia on the margin of the zoaria being somewhat similar in shape and position to those of that species, but I consider it quite distinct. The zooecia are very much smaller (less than half the size), and the opesia are elongated oval, not semicircular (occasionally there is a mucro projecting from the side of the opesia). An examination of broken specimens shows that the dorsal surfaces of these two species are quite different. In *H. liversidgei* they are more or less oval; in the species now described they are very long with square ends and less than half the width of those of *H. liversidgei.*

It is very numerous in the deposit. In age the zooecia are more calcified and the small avicularia are almost hidden.

Macropora cribrilifera, n. sp. (Pl. XXXIV., Fig. 2).

Zooecia elongated, hexagonal; margins narrow, raised; surface granular with scattered pore-like depressions. Thyrostome

arched above, slightly incurved below; margins raised; opercula calcareous. Ooecia large, oval, ribbed, with a central keel, sessile on zooecia.

Locality.—Mitchell River (J. Dennant).

A single specimen. The ooecium is of large size and is unfortunately imperfect, the front being broken away, but it was evidently cribriform with a central rib. The specimen is noteworthy, because in three of the zooecia the opercula are preserved and they are calcareous.

Cribrilina turgida, n. sp. (Pl. XXXIV., Fig. 3).

Zoarium encrusting. Zooecia oval, margins undefined; front wall thick and porcellaneous, with large pores irregularly disposed over the surface, the marginal pores incomplete showing as a series of small arches. Thyrostome opening upwards, lower margin thick, projecting and curved, upper margin invisible, apparently continuous with the dorsal wall. Ooecia galeate, smooth.

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

I have found two specimens of this species, one with ooecia (part of which is figured), the other without. This species is near *C. labiosa*, Busk, variety, *a fragilis* (C.P. xxx., p. 133, pl. xix., fig. 4), but there is no projecting spout in the front of the thyrostome, and the margin of the front wall is different, the shape of the zooecia being undefined and not distinctly "barrel-shaped" as described and figured by Busk.

Micropora elegans, n. sp. (Pl. XXXIV., Fig. 4).

Zoarium encrusting. Zooecia generally ovate, but often irregularly quadrate; margins very much raised and prominent; surface depressed but slightly convex, with small scattered pores; occasionally a very small opesiule in the upper angles of the zooecia. Thyrostome semicircular, margin raised. Ooecia globose, finely granular; a narrow smooth depression, interrupted in the middle, just above the aperture. Small avicularia above the thyrostome of infertile zooecia.

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

I have several specimens, all growing on *Membranipora ligulata.* It is near *M. coriacea* but differs from it. There are no

"knobs," most of the cells have no opesiules, but in a few there are indications of a very minute one in the upper angles. It is also near *M. variperforata*, Waters, but the zooecia are much shorter in proportion to the length and also more irregular in shape.

Micropora lunipuncta, n. sp. (Pl. XXXIV., Fig. 5).

Zoarium encrusting. Zooecia elongated, oval; margins thick, raised; surface slightly convex with small scattered pores; a rather large, more or less crescentic opesiule on each side, about one-third of the length of the cell from the distal end of the zooecia. Thyrostome semicircular with raised margins and a small avicularium above.

Locality.—Aire Coastal Beds (Messrs. Hall and Pritchard).

This is closely allied to the last species, but the zooecia are much larger, of a different shape and they have large crescentic opesiules; in the upper angles of some of the zooecia there is also a minute pore. On the right hand side of the figure will be seen a very irregularly shaped zooecium.

These two species have given me considerable trouble. I, at first, assumed that they were probably varieties of *M. elongata*, *Hincks sp.* as figured by Mr. Waters in A.M.N.H., series 6, vol. vi., pl. i., fig. 22 (not fig. 21), but he unites his *M. variperforata*, with that species, and considers both are the same as that described by Hincks as *Steganoporella elongata*. The descriptions and figures do not seem to warrant this. That figured by Mr. Waters (alluded to above) and his *M. variperforata*, are most probably the same species, but I do not think either can be *Steganoporella elongata*, Hincks (A.M.N.H., series 5, vol. vi., p. 380, pl. xvi., fig. 4), as Hinck's figure shows very large opesiules, a depression below, and at some distance from the thyrostome, and the avicularia point upwards, not downwards. Hincks placed it in *Steganoporella*, but Prof. Harmer states[1] that there are never any avicularia in *Steganoporella*, though they are present in the allied genus *Thalamoporella*, to which genus this species (S. elongata) should be referred.

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[1] Q.J.M.S., vol. xxxxiii., N.S., p. 236.

Micropora carinata, n. sp. (Pl. XXXIV., Fig. 6).

Zoarium cylindrical. Zooecia elongated, hexagonal with a central longitudinal ridge or keel; surface either granulated or with scattered pores; distal end protrudes. Thyrostome raised, semicircular, with thickened margin.

Locality.—Mitchell River (J. Dennant). This is very plentiful in the deposit.

Membraniporella decorata, n. sp. (Pl. XXXIV., Fig. 7).

Zooecia elongate, irregular in form, with oval raised area bearing 10 ribs on each side, which are thickened so as to show a circular convex elevation, and a very small round cavity on the inner portion of each rib. Thyrostome suborbicular, with a slight projection on each side. Ooecium elliptical, globose, adnate, situated obliquely on one side of upper part of the zooecium; ooecial aperture broad, arched above, straight below.

Locality.—Mornington (T. S. Hall).

The single small specimen figured is the only one I have found. The structure of the ribs, and the obliquity of the ooecium show it to be quite distinct from any other species.

Membraniporella rugosa, n. sp. (Pl. XXXIV., Fig. 8).

Zooecia oval, margins undefined; front surface with 9–11 thick rugose ribs. Thyrostome suborbicular, with thick raised margins, slightly incurved towards the lower part; operculum calcareous and apparently hinged to the incurved part of the margin of the thyrostome. Ooecia elongated, oval with a longitudinal very slightly raised median rib, and a few small scattered perforations; ooecial aperture arched above with similar, but much more prominent, incurvations to those of the zooecia.

Locality.—Mitchell River (J. Dennant).

The distinguishing features of this species are the large rugose ribs, the calcareous opercula apparently hinged at the sides and the elongated oval ooecia.

Corbulipora ampulla, n. sp. (Pl. XXXIV., Fig. 9).

Zooecia oval, front much raised, with large margined pores

irregularly disposed on the surface; the sides with a regular series of upright elongated pores. Thyrostome invisible, the peristome being very much produced.

Locality.—Mornington (T. S. Hall).

The specimen figured is the only one I have found, it has particles of pyrites scattered over it. It is a difficult matter to place this correctly, but I have provisionally placed it in *Corbulipora*, as it appears to me to have an affinity to *Corbulipora ornata*, McG.

Microporella rugosa, n. sp. (Pl. XXXIV., Fig. 10).

Zooecia very flat, undefined but apparently hexagonal, with a row of elongated pores round the margins; a few scattered pores on the surface; two smaller ones below the thyrostome and below and between them a deeper pore, apparently penetrating to the zooecial chamber. Thyrostome subtriangular with five spines round it; between the marginal pores and the others the surface is more or less raised into a rugose ridge. An avicularium, with a long triangular mandible pointing upwards and outwards on each side below the thyrostome.

Locality.—Lower Beds, Muddy Creek (J. Dennant).

The whole surface is very flat, and the margins of the zooecia are only here and there perceptible. The situation of the five spines surrounding the upper part of the thyrostome is indicated by pores, which, in many cases, have broken into the margin, giving an irregular form to it, but in two cases the perfect form is preserved.

Lepralia burlingtoniensis (Waters). Pl. XXXV., Fig. 11).

This species recorded by Mr. Waters from Aldinga, River Murray Cliffs, Mount Gambier, and Bairnsdale has not been recorded by Dr. MacGillivray, though I have found it fairly numerous in the deposits from Mitchell River, near Bairnsdale. I have also found it in the upper and lower beds Muddy Creek, Mornington, Griffin's (Moorabool), Cape Otway, and Aire coastal beds. I figure a specimen showing ooecia; they are globose, very much immersed, with pores on the upper portion; the aperture is arched above and the lower lip has a broad sinus. The

infertile zooecia show a denticle on each side giving it somewhat the appearance of a *Schizoporella;* this is not mentioned by Mr. Waters, nor shown in his figure.

Lepralia costata, n. sp. (Pl. XXXV., Fig. 12).

Zooecia elongated, hexagonal with broad very highly raised margins; surface depressed and concave, with a few scattered pores. Thyrostome oval, with a denticle on each side, situated at the upper extremity of the zooecia and at the junction of the raised margins, the narrow portion of the ridges of which divide and surround the thyrostome. Ooecia immersed, with very large semicircular aperture.

Locality.—Mitchell River (J. Dennant).

This I thought at first to be merely a variety of *L. burlingtoniensis*, as the chief distinction in those specimens with no ooecia was that the surface of the zooecia was concave, not convex, and the marginal ridges were very prominent; but when I found a specimen with an ooecial aperture it proved to be a different species. The ooecia appear to be wholly immersed, the aperture only showing.

Lepralia clavata, n. sp. (Pl. XXXV., Fig. 13).

Zoarium cylindrical, clavate. Zooecia diamond shaped; margins narrow, raised; surface convex, smooth. Thyrostome oval, at the upper extremity of the zooecia and at the junction of the margins. Ooecia large, globose, subrotund, with two irregular rows of rather large pores; aperture broad, arched above, concave below. Fertile zooecia with a few scattered pores.

Locality.—Clifton Bank, Muddy Creek (T. S. Hall).

This is evidently closely allied to *L. burlingtoniensis*, but the infertile zooecia have no pores and the ooecia are very much larger than the zooecia. There is a small cylindrical structure extruding from the thyrostome of the zooecium immediately below the fertile zooecium, but what it is I cannot say, it is evidently a parasitic growth.

Lepralia radiata, n. sp. (Pl. XXXV., Fig. 14).

Zoarium incrusting. Zooecia broad, irregularly hexagonal, distinct, with narrow raised margins; surface convex, with

granulated furrows radiating from a small oval avicularium, which is slightly raised and nearly in the centre of the zooecium. Thyrostome lofty, oval; a denticle on each side below the middle; lower lip hollowed.

Localities.—Orphanage Hill, Geelong (T. S. Hall); Mitchell River (J. Dennant).

This has somewhat the appearance of a *Schizoporella*, but the denticles at side are of a Lepralian character; it has not a true sinus.

Lepralia quadratipunctata, n. sp. (Pl. XXXV., Fig. 15).

Zooecia broadly oval, surrounded by one row (in some cases two rows) of subquadrate pores; middle smooth, convex. Thyrostome suborbicular, surrounded with 9–10 spines. An avicularium with long mandible pointed upwards on each side of the thyrostome. Ooecia globose, sub-immersed, smooth, surrounded by a row of subquadrate pores and two spines on each side of aperture.

Locality.—Clifton Bank, Muddy Creek (T. S. Hall).

This is a very distinct and beautiful species, the subquadrate pores are characteristic; the avicularia show denticles near the base, which are probably the remains of a bar, or, at any rate, the points of attachment of the mandible.

Lepralia cribrosa, n. sp. (Pl. XXXV., Fig. 16).

Zooecia elongated, convex, with very numerous large pores scattered over the surface. Thyrostome suborbicular, margin slightly thickened, lateral denticles small, no spines and no avicularia.

Locality.—Jimmy's Pt., Reeves River (J. Dennant).

This is a very distinct form, the thyrostome is broader than high, and the lateral denticles are very small, too small to show in the figure.

Lepralia calopora, n. sp. (Pl. XXXV., Fig. 17).

Zooecia irregularly hexagonal; margins narrow, raised; surface granulated; a very regular row of rather large pores all

round the cell, just inside the margin. Thyrostome broadly elliptical with a denticle on each side near the lower margin, which is nearly straight. Ooecia globular, partly immersed, with a few large round depressions on the surface; ooecial aperture semicircular with a denticle at each lower angle.

Locality.—Lower Beds, Muddy Creek (J. Dennant).

A single specimen. A very elegant species characterized by the very regular row of round pores on the margin of the zooecia.

Lepralia airensis, n. sp. (Pl. XXXV., Fig. 18).

Zoarium cylindrical. Zooecia oval, margins raised; surface convex, granulated. Thyrostome oval, with a denticle on each side near the lower margin; margins raised; a small avicularium in the lower margin, but entirely outside the thyrostome. Ooecia globose, granulated.

Locality.—Aire Coastal Beds (Hall and Pritchard).

This is rather difficult to place; it somewhat resembles a *Porella*, but as the small avicularium is entirely outside the margin of the thyrostome, and as it has the denticles characteristic of *Lepralia*, I place it in that genus.

Lepralia partipunctata, n. sp. (Pl. XXXV., Fig. 19).

Zooecia hexagonal, elongate; margins narrow, raised; surface covered with small round pores, except on an elongated triangular space below the thyrostome. Thyrostome suborbicular.

Locality.—Mitchell River (J. Dennant).

A single specimen. This is a very elegant species and much resembles *Phylactella porosa*, McG., but the zooecia are quite flat, and the thyrostome has a denticle on each side, and is destitute of a raised peristome.

Lepralia mamillifera, n. sp. (Pl. XXXV., Fig. 20).

Zooecia elongated, covered with large globular nodules. Thyrostome suborbicular, with raised peristome, and on each side there is an avicularium, with the mandible pointing inwards, on a highly raised rugose prominence.

Locality.—Clifton Bank, Muddy Creek (T. S. Hall).

A single specimen. The highly raised avicularium projects over the thyrostome so much as to give it the appearance of being hour-glass shaped, but the true shape can be distinguished, it is suborbicular, slightly broader distally, with a denticle on each side near the proximal portion.

Ovaticella, nov. gen.

Zooecia ovate, ventricose; a large perforated area in front. Thyrostome transversely elliptical, opening upwards.

Ovaticella turbinata, n. sp. (Pl. XXXV., Fig. 21).

Zoarium unilaminate. Zooecia oval, much raised, distinct, arising from a flat surface; the actual margins or junction of the zooecia being indistinguishable. In the centre there is a large circular perforated area, above which are a large and small pore on each side below the thyrostome. Thyrostome transversely elliptical, at the summit of the zooecia, opening upwards.

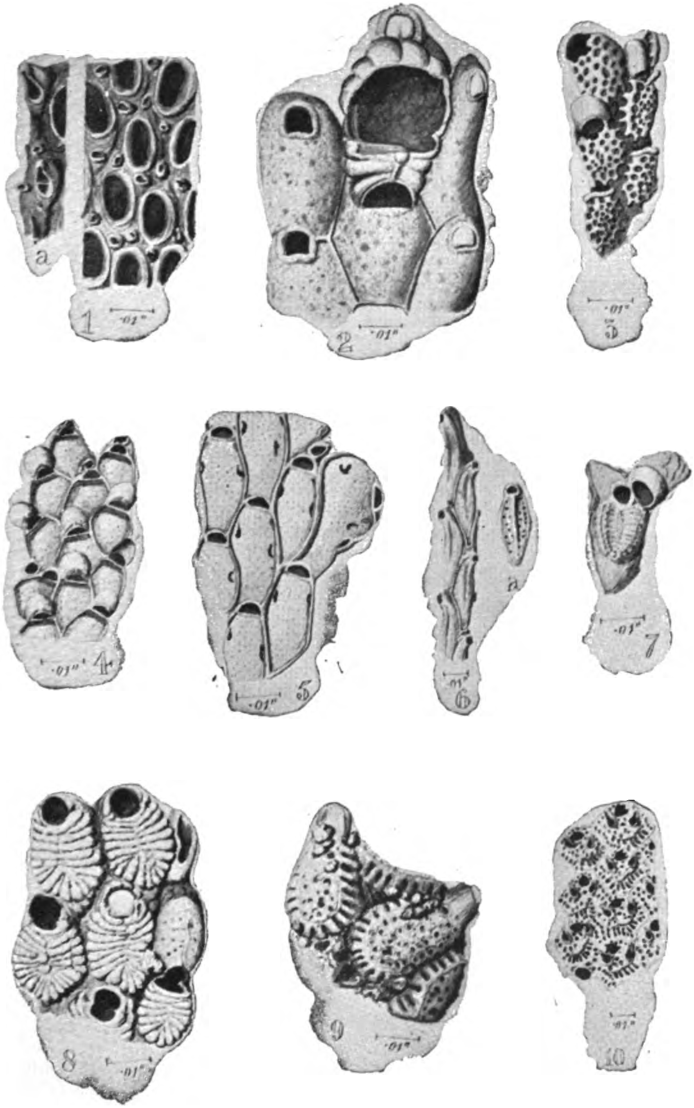
Locality.—Mitchell River (J. Dennant).

A single specimen, which is not in very good preservation. The perforated area has broken away, leaving a large stellate opening. This area and the shape and aspect of the thyrostome are very distinctive.

EXPLANATION OF FIGURES.

Plates XXXIV., XXXV.

Fig. 1.—Membranipora ligulata. *a.* vicarious avicularia.
„ 2.—Macropora cribrilifera.
„ 3.—Cribrilina turgida.
„ 4.—Micropora elegans.
„ 5.—Micropora lunipuncta.
„ 6.—Micropora carinata. *a.* front view of zooecium with pores.
„ 7.—Membraniporella decorata.
„ 8.—Membraniporella rugosa.
„ 9.—Corbulipora ampulla.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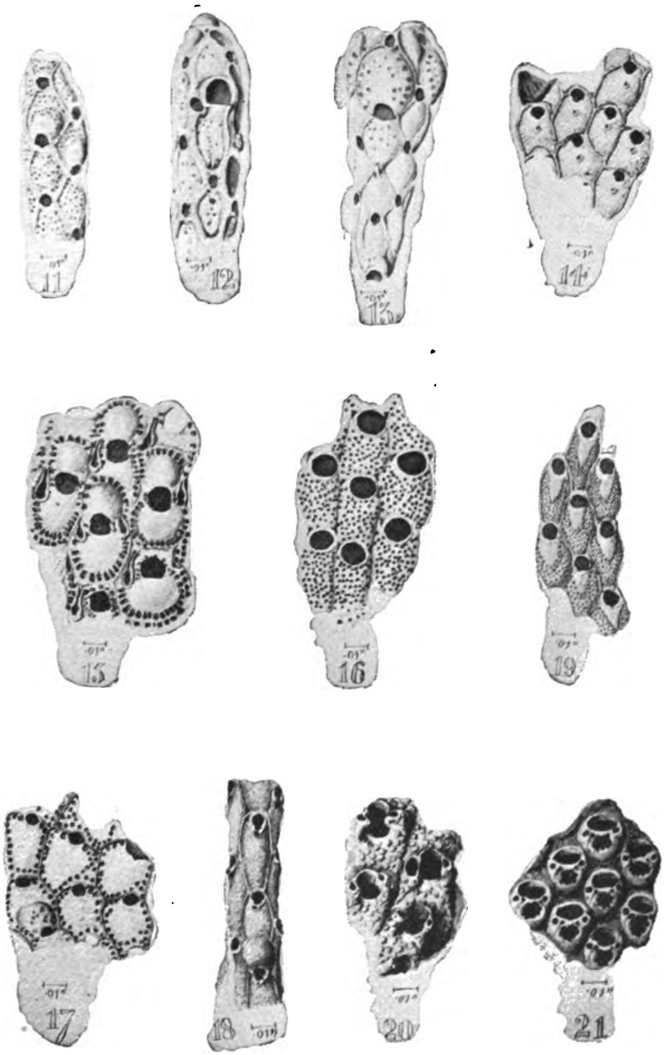
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Fig. 10.—Microporella rugosa.
„ 11.—Lepralia burlingtoniensis.
„ 12.—Lepralia costata.
„ 13.—Lepralia clavata.
„ 14.—Lepralia radiata.
„ 15.—Lepralia quadratipunctata.
„ 16.—Lepralia cribrosa.
„ 17.—Lepralia calopora.
„ 18.—Lepralia airensis.
„ 19.—Lepralia partipunctata.
„ 20.—Lepralia mamillifera.
„ 21.—Ovaticella turbinata.

Art. XVI.—*The Petrology of certain Victorian Granites.*

By EVELYN G. HOGG, M.A.,

Acting Professor of Mathematics, University of Tasmania.

[Read before the Australasian Association for the Advancement of Science, Melbourne, 12th January, 1900.]

The principal sources of information with respect to the distribution of granite in Victoria are the essay of Mr. A. R. C. Selwyn, published in connection with the catalogue of the Victorian Exhibition of 1866; and the text-book on the Geology and Physical Geography of Victoria of Mr. R. A. F. Murray, published in 1887. Brief macroscopic descriptions of Victorian granites may be found in the "Catalogue of the Rock and Mineral specimens in the Technological Museum, Melbourne," edited by the late J. Cosmo Newbery.

Up to the present time little attention appears to have been paid to the petrology of the granites of Victoria. Notes on the subject are scattered through the writings of Mr. A. W. Howitt, and an interesting paper on the granite of Cape Woollomai, by Mr. James Stirling, Government Geologist, occurs in the Progress Report of the Mines Department, 1899, vol. x., p. 107.

The author of the present paper has had during the past few years many opportunities of collecting granites in Victoria, and he has recently received from Mr. A. E. Kitson, F.G.S., of the Mines Department, through the courtesy of Mr. Stirling, a few specimens of granitic rocks from some of the more inaccessible parts of Victoria.

In the following paper the petrological characters of these granites are briefly described:—The terminology of rocks of granitic type is a matter of discussion. In the present paper normal granite is defined as a holocrystalline rock composed of quartz, biotite and two felspars, the triclinic felspar being subsidiary to the monoclinic. Variation from the normal form may, among other ways, take place by a change in the relative propor-

tions of monoclinic and triclinic felspars present until a point is reached in which the triclinic felspar is clearly the dominant one.

To this extreme type there is no difficulty in assigning the term granitite. Between these limits, however, lies a large range of rocks in which the relative proportions of the felspars may vary greatly, and it is to be desired that a name existed to apply to these intermediate rocks. The name which might well have been applied to them is granitel; this term, however, has been secured for rocks of the aplite type in which mica is either absent or present only in small quantities. The term "granitel" has not as yet received any general adoption, and it is worth considering whether the original signification of the word might not be changed, and the term in future be applied to rocks of granitic type in which neither felspar can be said to predominate over the other. In the present paper, however, I have not adopted this term, and have preferred to classify the rocks in question on the old well-established description of a true granite. So long as the rock is one in which the monoclinic felspar is clearly the important one the rock is a granite, but when the triclinic felspar ceases to be subsidiary to the monoclinic felspar I have adopted the term granitite. In other words, I suggest the extension of the word "granitite" to include all holocrystalline quartz—biotite—rocks in which a monoclinic felspar is not the dominant one, thus bridging over the gap between the granites and the rocks formerly styled granitites. To conclude the question of nomenclature, a normal granite with muscovite added is, adopting the French term, a granulite; a normal granite with hornblende is a syenite, granitite with hornblende is a diorite, while the somewhat rare case of a granitite with muscovite is called a muscovite-granitite.

Examination in the field shows that in a small area rocks of granitic type may vary greatly in macroscopic appearance even when no contact or regional metamorphism may have taken place, and it may therefore happen that to describe fully the granite of a particular district it would be necessary to prepare a large number of slides. This course the author has not been able always to adopt, owing often to the impossibility, in the absence of recently-worked quarries, of obtaining specimens suitable for slicing. Even fresh-quarried granites often are so brittle that a

sufficiently thin slide cannot be obtained without reducing the rock to a very fragmentary condition. The decomposition which the felspars have in most cases undergone often makes the exact determination of the plagioclase felspars quite impossible. So far as possible specimens typical of the locality under examination have been sliced and are described in the following paper.

The extent and boundaries of the granite outcrops are not given as information on this point, can be more easily and accurately obtained from the geological maps of Victoria, issued by the Department of Mines, and only brief reference is made to the other field relations.

Harcourt.—A granitite showing a white felspar, greenish quartz and black mica. The twinning planes of the triclinic felspar are visible to the naked eye. Under the microscope it is seen that monoclinic and triclinic felspars are fairly equally distributed through the slide. The triclinic felspar has the more perfect terminal faces, often shows zonal structure and occurs as an inclusion in the monoclinic felspar. Measurements suggest that the triclinic felspar is oligoclase. The orthoclase felspar shows Carlsbad twinning and intergrowth with a triclinic felspar, probably albite. Apatite occurs in slender prisms and as grains included in the biotite. This granitite is intrusive into the Lower Silurian rocks, the latter being, according to Mr. E. J. Dunn, F.G.S., altered in the neighbourhood of Bendigo for a distance of 25 chains from the granitite. Similar contact metamorphism has not yet been noted in the deepest mines of the Bendigo field.

Traawool, 7 miles E. of Tallarook.—A coarse-grained granitite, rich in quartz, and showing a white felspar and biotite, the latter mineral often in perfect hexagonal crystals. Under the microscope it is seen that the triclinic felspar is as well represented as the monoclinic, that it has better crystal definition and that it occurs as an inclusion in the monoclinic felspar. Both felspars are much decomposed, but the triclinic felspar shows the less alteration of the two. A small amount of apatite is present; muscovite occurs in minute clusters and is probably a secondary product.

Millpark, N. of Preston.—A fine-grained granitite showing a white felspar, quartz, and biotite. In the thin slide triclinic

felspar, which is apparently oligoclase, is represented in larger quantity than the monoclinic; the triclinic crystals have good terminal faces, while the orthoclase rarely has. Among the accessory minerals are zircon and apatite. The order of crystallization appears to have been—accessory minerals, mica, oligoclase, orthoclase, and quartz. The latter mineral is free from inclusions. This granitite is intrusive into the Upper Silurian Rocks.

Harkaway.—A fine-grained syenite showing a white felspar, biotite, hornblende, and much quartz. Monoclinic felspar appears under the microscope both in larger crystals and greater quantity than the triclinic felspar; the latter has the more perfect crystal edges of the two, and is a frequent inclusion in the monoclinic felspar. This phomenon of inclusion and the manner in which the orthoclase is moulded on the plagioclase show that the latter mineral was the first to crystallize. Hornblende is present in small quantity; it is somewhat bleached in colour, and is only faintly pleochroic; the crystals have ill-defined terminal faces. Biotite is often altered to chlorite. A small amount of apatite is present.

This rock is in many places traversed by fine-grained veins, which weather out from the softer main mass. Under the microscope it is seen to be mainly composed of quartz grains, through which are distributed ill-bounded crystals of microcline, a triclinic felspar—probably oligoclase—grains of a monoclinic felspar and a minute quantity of mica. There is no trace of hornblende. The material forming these veins appears to occupy cracks formed in the main mass by contraction under cooling, and to be a later emission from the central magma. Its constitution seems to support the view that when more than one emission takes place from the same central magma, the later emissions are more acid in character than the earlier ones.

Warburton, six miles east of township, near tin-mine.—A coarse-grained granite with large pink felspars, blebs of quartz and a small quantity of mica. Under the microscope it is seen that the prevailing felspar is a somewhat cloudy orthoclase. The triclinic felspar is oligoclase, it occurs as a frequent inclusion in the orthoclase, when it is sometimes bounded by a thin layer of quartz. There are indications in one slide that a partial crystallization of the quartz had accompanied that of the orthoclase. Apatite is sparingly represented.

Warburton, near old township.—A fine-grained granite rich in biotite. Orthoclase somewhat destitute of crystal boundaries occurs in larger plates and greater quantity than the triclinic which appears to be an acid-oligoclase. The latter shows good zonal structure and is twinned according to both albite and pericline laws. It has well-marked crystal edges except when it occurs as an inclusion in the orthoclase, in those cases the edges are often eroded. Zircon and apatite are rather frequent, quartz is free from inclusions except mica.

Somerton.—Southern end of outcrop, about 3½ miles N.N.W. of Broadmeadows Station.—A medium-grained granitite with white felspar, bottle green quartz and biotite. In the slides it is apparent that the monoclinic felspar is subsidiary to the triclinic variety. The latter has good crystal boundaries and has resisted alteration better than the orthoclase. Quartz is well represented, and the rock is very rich in apatite. Biotite is largely altered to chlorite. A small amount of muscovite is present, it appears as an alteration product of orthoclase.

Frankston.—On the eastern side of Port Philip Bay are three isolated granitic areas, Frankston, Mount Martha and Dromana. It is possible that at one time they formed a continuous chain. At Dromana the hills attain, at Arthur's Seat, a height of 970 feet, and at Mount Martha and Mount Eliza close on 600 feet. The isolated areas are separated on the shore line by tertiary beds, and are bounded easterly by Upper Silurian rocks into which they have intruded. The rock from Frankston is a medium-grained granitite showing a pink felspar, quartz and biotite. Orthoclase and plagioclase felspar are about equally represented in the slide, the biotite and quartz are normal. No traces of apatite, zircon or other accessory minerals could be found.

Mount Martha. — Watson's Quarry. A medium-grained syenite showing white felspar, clear quartz, biotite and long prismatic crystals of hornblende. The dominant felspar is monoclinic, it contains as inclusions triclinic felspars with rounded edges. The triclinic felspar is an acid oligoclase with a maximum extinction angle, measured from the twin line, of about 10°. Hornblende is present in moderate quantity; the terminal faces of prismatic sections are for the most part wanting; the pleochroism

is somewhat intense, it appears to be entirely free from inclusions. The quartz and biotite present no features of interest. A small quantity of apatite is shown in the slides.

A vein about one inch thick traverses the quarry, it is a fine-grained rock which appears, in the thin slide, to be composed of grains of quartz on which a monoclinic felspar is moulded. It contains a small amount of mica, but there is no trace of hornblende. It is essentially an acid rock.

A feature of interest in the quarry is a large sub-angular block of quartzite contained in the granite. It appears identical in microscopic character with metamorphosed rock occurring near the junction of the syenite and silurian beds.

Mount Martha Point.—The main rock here does not differ from the syenite of Watson's quarry except that the hornblende is less frequently present. It is traversed by thin veins similar to the one above described. It possesses some interest however in the occurrence of (1) a vein of pegmatite, (2) dark ovoid-shaped basic secretions.

The pegmatite vein appears macroscopically to be composed of felspar and quartz only, but the microscope shows the presence of a minute quantity of biotite. The felspar appears to be exclusively orthoclase, and there is considerable intergrowth of quartz and felspar. Hornblende is absent.

The basic secretions occur in small ovoid masses rarely more than a few feet in diameter. The normal form is a fine-grained dark rock in which biotite is the prevailing mineral, variation from this type arises from the occurrence in the rock of porphyritic masses of pink felspar. Examined microscopically, the rock is seen to be a crystalline granular aggregate of mica, quartz and orthoclase, with a small amount of hornblende. [One slide failed to yield any traces of hornblende]. The almost entire absence of a triclinic felspar is noticeable. Sphene and apatite are both present in small quantities.

Dromana.—Quarry on Arthur's Seat.—A fine-grained syenite in which a pink felspar, quartz and mica are visible. In the thin slide the monoclinic felspar is seen to preponderate over the triclinic, it is frequently twinned according to the Carlsbad law. The triclinic felspar is occasionally an inclusion in the monoclinic. Hyp-idiomorphic crystals of a light green hornblende showing

marked pleochroism are scattered through the slide. A somewhat fibrous biotite, often bent and contorted, is sparingly distributed. Apatite occurs in prisms and grains, it is a frequent inclusion in hornblende and biotite.

Dromana.—Coast near township.—The main rock mass is here too weathered to furnish satisfactory slides. It is, however, penetrated by veins and contains ovoid patches very similar in appearance to those occurring at Mount Martha and previously described. Under the microscope it is seen that in the basic secretion hornblende is the prevailing mineral, there is a fair amount of mica, and both monoclinic and triclinic felspars appear. Sphene and apatite both occur and there are traces of quartz. As at Mount Martha, the veins are poor in mica and entirely without hornblende.

Cobungra High Plains.—A medium-grained granite with a pink felspar, bottle green quartz and biotite in small clusters. In this rock the prevailing felspar is a monoclinic which contains many rounded fragments of triclinic felspar. Both felspars are much altered and clouded. A striking feature of the rock is the abundance of sphene and the occurrence of ilmenite in characteristic cross-hatched sections. Apatite is also present.

Watts River.—Aqueduct, near Healesville.—A medium-grained granitite showing white felspar, greenish quartz and biotite. Careful examination of the slide shows that the triclinic felspar occurs more largely than the monoclinic, it has better crystal boundaries and has suffered less alteration. Measurements of the triclinic felspar give a maximum extinction angle of 16°, thus leaving it in doubt whether the felspar is an albite or oligoclase-andesine. Biotite is well represented, it is frequently altered to chlorite. Apatite is present. Calcite and muscovite appear as secondary products.

Little Snowy Creek.—Above Tallandoon, near Tallangatta, Mitta Mitta River.—A coarse-grained greisen with cassiterite. The rock is almost entirely composed of quartz and muscovite. Sphene is present in fair quantity. The quartz grains are charged with opaque dust which is arranged along intersecting lines and curves.

Mount Hotham to Victoria River, Cobungra.—A somewhat fine-grained granite rich in quartz and biotite with white felspar.

It is with some diffidence I class this as a granite, as owing to the decomposition of the slide it is difficult to determine whether the monoclinic felspar or the triclinic felspar is the preponderating one. Biotite is somewhat bleached and contains minute zircons. Quartz is free from inclusions. Apatite is sparingly represented.

For the last four specimens described I am indebted to Mr. A. E. Kitson, F.G.S., of the Mines Department.

Yackandandah.—An account of the field relations of the Yackandandah and Beechworth granitic areas is given in Progress Report, No. 2, of the Department of Mines, pp. 75, etc. The specimens sliced from this locality were all taken from the bed of the creek about a mile below the township. Though the quarries near the township used for building purposes have only been closed for about 10 years it was impossible to find there any specimens which weathering had not rendered quite unfit for slicing. The rock is fairly constant in appearance over considerable areas near the township. Large milk-white crystals of felspar embedded in a matrix of quartz and biotite is the characteristic form, the texture is for the most part coarse. Close inspection shows that mica is a frequent inclusion in the felspar. Scattered through the main mass are frequent patches of dark closed-grained material which is harder and more difficult to fracture than the surrounding rock. These patches are of small dimensions and the line of demarcation between them and the surrounding rock is well marked. Biotite, quartz and triclinic felspar can be detected in them by the naked eye.

The main rock mass at Yackandandah is an interesting example of the occurrence within a short distance of each other of both granite and granitite. In some slides the monoclinic, in others the triclinic, felspar is the leading one. The triclinic felspar is an acid oligoclase with a maximum extinction angle measured from the twin line of about 10°. It occurs in two generations, being found not only as an inclusion in the monoclinic variety but also in the triclinic. There is a small amount of microcline present in the rock. Quartz and biotite are normal. Sphene and apatite occur in most of the slides.

The basic secretions under the microscope show a crystalline-granular structure in which biotite and mica are the prevailing

minerals, the triclinic felspar which is oligoclase is almost destitute of crystal edges. Sphene and apatite are well represented and there are traces of zircon. A feature in these secretions is the colourless needles which penetrate the quartz, they are possibly rutile. Monoclinic felspar is present in very small quantity. Most of the slides show a small amount of epidote, which appears always to be associated with the biotite. The quartz shows a fair number of cavities, mostly cylindrical in shape, in which enclosed crystals may be seen. Liquid cavities are rare.

Beechworth (1) Quarry, near Powder Magazine.—A coarse-grained granite, showing a pink felspar, dark green quartz and a little biotite. The prevailing felspar is orthoclase, it contains inclusions of mica and triclinic felspar and in it perthitic structure is well displayed. Quartz is free from inclusions. Apatite and muscovite are present in small quantities.

(2) Quarry on creek above town.—This rock does not differ microscopically from the one last described except that the felspars are in a better state of preservation, biotite is present in greater quantity and muscovite is absent.

(3) Quarry behind Jail.—A medium-grained granite, showing pink and white felspars, bottle-green quartz and a small amount of mica. This rock is similar to the ones previously described from Beechworth except that the triclinic felspar plays a more important part, it is, however, subsidiary to the monoclinic. Both felspars appear to have been largely moulded on the quartz, the triclinic felspar occurs as sub-angular fragments included in the monoclinic. Apatite and zircon are sparingly represented as inclusions in biotite.

(4) Road to Wooragee, about half-a-mile from Beechworth.—A coarse-grained granite, showing a pink felspar, bottle green quartz, and a very small amount of biotite. The felspar present is almost entirely orthoclase, triclinic felspar being quite subsidiary. The triclinic felspar is occasionally included in the monoclinic. There are traces of muscovite, but apatite appears to be absent. Owing to the feeble development of mica, this rock verges on an aplite.

(5) Dyke through Rocky Mountain Gold Mining Company.—Macroscopically this rock is very similar to the specimen

described from the quarry behind the Beechworth Jail. Under the microscope it appears to be somewhat richer in quartz, the relative proportions of the felspars present is about the same, the triclinic felspar occurs as an inclusion in the monoclinic, it has undergone too much alteration to admit of any determination of its character.

Gabo Island.—My specimens from this locality are due to Professor David, of Sydney University, and to Messrs. Chambers and Clutten, Melbourne. This rock has been described in Selwyn's Catalogue of Rock Specimens and Mineral in the National Museum (1868) as a syenitic granite, consisting of red felspar, quartz and hornblende. This description appears to have been copied by Murray in his Geology and Physical Geography of Victoria (1887), and in the Catalogue of the Rocks of Victoria, in the Technological and Industrial Museum, Melbourne (1894), similar language is employed of this rock. The specimens obtained by me from Professor David did not satisfy this description, as biotite was evidently a constituent while hornblende was not. Under the microscope the sections showed much alteration, the felspars being very clouded, while the biotite was largely altered to epidote. In some cases magnetite had separated out in grains from the mica, with the result that the mica had a somewhat bleached appearance, while the intensity of its pleochroism was reduced. In addition to the epidote associated with biotite were other clusters of epidote grains; it is possible that this epidote occurs as an alteration product of hornblende. If such is the case hornblende was originally present in the rock only in small quantity. The monoclinic felspar is the predominant one. Quartz is fairly free from inclusions. Apatite is in considerable quantity, and there are traces of zircons. The specimens obtained from Messrs. Chambers and Clutten approximate in appearance the rock described by Selwyn, but biotite is present in addition to hornblende. In the thin section green hornblende shows moderate pleochroism; prismatic sections are wanting in terminal faces, good cross sections with characteristic cleavages occur. There is some alteration to epidote visible in both the hornblende and the biotite. As regards the felspars, quartz and accessory minerals, this rock is very similar to the one previously described. This variation in

its constituents in specimens taken from adjoining localities is in accordance with observations made in other parts of Victoria. The rock should be classed as a syenite.

The specimens of Victorian granitic rocks examined in this paper direct attention to the following points :—

1. The relatively large occurrence in these rocks of plagioclase felspar.
2. The plagioclase felspar sometimes occurs in two generations, has better crystal definition than the orthoclase, and has almost always preceded orthoclase in the order of crystallization.
3. The persistent occurrence of apatite as an accessory mineral in both granites and granitites.
4. The acid nature of granitic veins, and the frequent occurrence of basic secretions.

Art. XVII.—*Description of some New Victorian Fresh-water Amphipoda.*

By O. A. SAYCE.

(With Plates XXXV.–XL.).

[Read 13th December, 1900.]

Very little is known of the fresh-water and terrestrial Amphipoda of Australasia. The only fresh-water species hitherto recorded from any part of the continent is one from Victoria, Niphargus pulchellus, described by me in the last volume of this journal. From Tasmania, with which the southern Victorian fauna and flora are closely related, two species, Niphargus montanus and N. mortoni, have been described by Mr. G. M. Thomson.[1]

Concerning the terrestrial Amphipoda, Professor Haswell originally formed two species, Talitrus sylvaticus, from New South Wales, and T. assimilis, from Tasmania; however, subsequently (1885) he made the latter a synonym of the former, but wrongly referred to it as T. affinis.[2] The mistake of quoting affinis for assimilis was previously made in his Australian Crustacea Catalogue, and also later by G. M. Thomson in his paper on Tasmanian Crustacea,[3] where the Sydney and Tasmanian forms are compared and assigned to the original species, T. sylvaticus. This species also exists in great numbers in damp forest country throughout Southern and North-Eastern Victoria.

The New Zealand fresh-water and land Amphipoda, so far described, are as follows—from surface waters Hyalella mihiwaka, Chilton, Pherusa caerulea, G.M.T., Calliopius fluviatilis, G.M.T.; from subterranean waters, Calliopius subterraneus, Chilton, Crangonyx compactus, Chilton, and Gammarus fragilis, Chilton; and of terrestrial habit, Orchestia sylvicola, Dana.

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1 Proc. Royal Society Tasmania, 1892.
2 Proc. Linnean Soc. N.S.W., vol. x., pt. i.
3 *Loc. cit.*, p. 15.

The present paper describes four new species, all Victorian fresh-water inhabitants, for one of which I have thought it necessary to form a new genus, which embraces also Thomson's Niphargus montanus from Tasmania.

I desire to acknowledge my indebtedness to Mr. G. M. Thomson, F.L.S., of Dunedin, for furnishing me with co-types of his Tasmanian species, to Professor Baldwin Spencer, F.R.S., for a few specimens that he had collected from Lake Petrach, Tasmania, and also to Messrs. J. Shephard, J. Gabriel and C. Barber for specimens collected from this colony.

Family ORCHESTIDAE.

Hyalella australis, sp. n.

(Plate XXXVI.).

Male.—Body smooth, back deeply arched. Cephalon longer than first segment of mesosome, lateral corners broadly rounded, and slightly projecting between the bases of the antennae. Eyes large, slightly oval, black. Side plates of first and second segments of mesosome deeper, those of third and fourth equal to their respective segments. Second and third segments of metasome with infero-posterior angles acute, very slightly produced backward.

Upper antennae very long, measuring half the length of the body, flagellum of about ten articuli, longer than its peduncle. Lower antennae shorter than the upper, its peduncle reaching slightly beyond the peduncle of upper, flagellum of about seven articuli. First gnathopoda short, hind margin of carpus slightly lobed, with the margin evenly rounded, and fringed with about nine delicately feathered setae; propodus sub-trigonal, longer than the carpus, palm straight, oblique, defined by a small spine, margin setose. Second gnathopoda long, with the carpus small, not lobed, and free from setæ, propodus large, almost as long as the basis, subovate, narrowing distally, palm very oblique, of even length to the joint's greatest width, slightly convex, and defined by a small rounded tubercle, margin spinose. Dactylus falciform, margin entire. Third and fourth pairs of peraeopoda with the bases expanded in a lesser degree than the fifth,

posterior margins of each minutely serrate. The third peraeopoda considerably shorter than the fourth, and the fourth slightly longer than the fifth, the coxal lobe of the fourth deeply produced, and its hind margin bearing five spinules. First uropoda reaching slightly beyond the end of the second, peduncle much longer than rami, with few spines; the second with peduncle of subequal length to its rami, inner ramus slightly longer than outer; the third short, peduncle stout, longer than its ramus, which is minute, conical, apically rounded, and tipped by a few long setae. Telson entire, thick at the base, convex above, the end wide, almost straight, and bearing four spinules, lateral margins convex.

Female.—Smaller in size but of similar form to the male except in the second gnathopoda, which are subequal in form to the first. The second is longer, the propodus slightly larger, and, compared with the first gnathopod of the male, the propodus is similar in armature, but longer, the palm narrower, transverse, and the margin slightly convex. The carpus also is longer and bears about thirteen finely feathered setae.

Colour.—When alive pale green.

Length.—Largest ♂ 8 mm. Largest ♀ 7·25 mm.

Occurrence.—Very common in the following lagoons along the valley of the River Yarra and its tributaries, Fernshaw, Christmas Hills (collected by C. Barber), Heidelberg, East Kew, Melbourne Botanical Gardens, and Elwood Swamp.

Distribution.—Lake Petrach, Tasmania. Altitude 2900 feet (collected by Professor Baldwin Spencer).

Remarks.—Hyalella appears to have no conspicuous characters at variance with Hyale except in respect of the telson which is entire, whereas in Hyale it is cleft to the base. The species of the latter genus are mostly marine inhabitants, and so far those of Hyalella have only been recorded from the fresh-waters of North and South America and New Zealand. The present species is undoubtedly congeneric with H. mihiwaka, Chilton, found in mountain streams in New Zealand, but is easily distinguished from it by the narrower side-plates, the shape of the hands, the longer segments of the urosome, and by the peduncle of the terminal uropoda being distinctly jointed to its segment, and not apparently coalescent, as in that species, also

in the upper antennae which are peculiar to the family character in being longer than the lower. In agreement with H. mihiwaka the first maxilla does not possess a rudimentary uniarticulate palp, but only a slight truncate projection without the vestige of a joint and differs in this respect from Professor S. I. Smith's generic description.

SUPPLEMENTARY DESCRIPTION.

The *Anterior Lip* is broad, deep and evenly rounded distally.

Mandibles.—In the left-hand mandible the cutting-edge is broad and composed of three large and three smaller teeth, the secondary edge has six small teeth, and below this ridge are three or four plumose spinules. In the right-hand mandible the cutting-edge has six teeth and the secondary process is apically cleft into two ridges, the outer one being finely serrated, and ending laterally in a long pointed tooth, and the inner divided into three stout teeth. Between this process and the molar tubercle there are two long and a number of shorter plumose spinules. The molar tubercle of each is stout, the end covered with rows of very strong denticles, and on one side, near the crown, there is a very long plumose seta. There is no trace of a palp.

The *Posterior Lip* is broad, the lobes closely set and distally evenly rounded, and the inner margin and apex fringed with short fine setae.

First Maxillae.—The outer lobe is very long and apically furnished with about eight toothed spines. Medianly on its outer margin there is a slight projecting knob with truncated summit, which indicates the rudimentary palp, but, after carefully examining several specimens, I failed to find any articulating joint. The inner lobe is very narrow and short, being about half the length of the outer lobe, and tipped by two long and delicately plumed setae.

Second Maxillae.—The outer lobe is very narrow and tipped with numerous long simple setae. The inner lobe is normally broad, not reaching to the end of the outer lobe, its summit faces obliquely, and is furmished with a row of nine pectinated setae and a parallel row of simple setae, also at the distal inner angle there is a long plumose seta.

Maxillipedes.—These agree very closely with H. mihiwaka, but the inner lobe compared with that species is short, only reaching to the extremity of the inner distal angle of the first joint of the palp. The inner margin of this lobe is straight, the outer convex, the summit truncated and tipped with three short stout teeth, which successively increase in size from the inner to the outer sides; distally the inner margin has a row of plumose setae which extend across the end and continue for a short distance along the outer margin, also a few scattered ones near the base of the teeth on the side that faces dorsally. The outer lobe extends to half the length of the palp's second joint, its inner margin is slightly convex, and fringed with a row of fine simple setae, the outer margin is deeply curved and free from setae. The palp has the first joint tufted with a few short setae on the outer distal angle, the second gradually widens distally, due to the inner margin being laterally produced; this margin is fringed with long fine setae, and the outer angle has a tuft of setae; the distal margin is straight. The third joint has the inner distal angle slightly produced, evenly rounded, and setose, there is also a tuft of setae at the outer distal angle and also another medianly on the outer margin. The last joint, which is slightly embedded in the preceding joint, is short, broad at the base, bluntly pointed, and bearing one stout seta at the apex, and a few fine ones on the inner margin.

Gnathopoda.—The coxal plate of the first gradually widens distally, and the lateral angles are broadly rounded, that of the second becomes gradually narrow distally. The margins of each are entire and unclothed.

Peraeopoda.—The coxal plate of the second is very wide, and the hind margin is somewhat excavated. In the third pair the coxa is bilobed, and the front margin of the hind lobe bears about five rather long spines; in the fourth pair the single-coxal lobe is very deeply produced, and its posterior margin spinose, that of the fifth pair is small with margin unclothed.

The branchial lamellae are rather small and narrow at the base.

Uropods.—The first has the peduncle twice the length of the rami, and the upper margin has only a few spinules, the rami are short and subequal. The second has the inner ramus slightly longer than the outer, and the whole of the upper surface thickly

dotted over with short spinules; the outer ramus has a single row of spinules on the outer upper margin. The third has been sufficiently described.

Family CALLIOPIIDAE.

Atyloides gabrieli, sp. n.

(Plates XXXVII. and XXXVIII.).

Body robust, smooth, without dorsal projections. Cephalon deep, rostral projection minute, lateral corners evenly rounded, inferior edges deeply excavated, post-antennal corners slightly produced and narrowly rounded. Eyes small, spherical, black. Coxal plates of first four segments of mesosome of subequal depth to their respective segments, each broadly rounded below and unclothed, the first scarcely expanded distally, the fourth as broad as deep, and deeply excavated behind. Segments of metasome deep, their postero-lateral angles right angled.

Upper antennae a little longer than half the length of the body, secondary appendage minute, uniarticulate; peduncle one-third the length of the flagellum, its lower margin beset with numerous clusters of long setae, first joint stout, second slightly shorter, third half as long as the second; flagellum with first joint oblong, succeeding ones transverse. Lower antennae with peduncle almost reaching the extremity of peduncle of upper, its two last joints subequal, and clothed along their lower margins with long setae, flagellum somewhat longer than the peduncle. Gnathopoda small, subequal, the second longer and the hand slightly larger; carpus as long as the propodus, posteriorly bearing about seven transverse rows of long feathered setae, and expanded distally to a small rounded lobe; propodus oblong, widening slightly distally, palm oblique, almost straight, and minutely serrate, margin spinulose, limited by a long spine, outer face with an oblique row of five clusters of long setae; dactylus as long as the palm, entire and unclothed. First two pairs of peraeopoda longer than gnathopods, succeeding ones slightly increasing in length, bases expanded. First uropoda with peduncle longer than rami, rami subequal, extending nearly to the

end of the third pair; second shorter, its outer ramus rather shorter than the inner; third with peduncle short, rami subequal, lanceolate, inner and outer margins fringed with spinules, from the axils of which spring long plumose setae. Telson long, cleft almost to the base, its outer lateral margins setose, and gradually curving to a pointed apex, its dorsal surface with a few fascicles of setae.

Length.—Largest specimen 11·5 mm.

Colour.—Very varied, sometimes almost free from colour, and semi-translucent, at other times more or less flecked with indefinite markings of brilliant pink over the cephalon, back, and sides, and also the anterior appendages.

Occurrence.—Streamlet at Thorpdale (Gippsland); Dandenong Creek, near Bayswater (collected by J. Gabriel); and from Mathinna Falls, Fernshaw. Altitude about 1,500 feet.

Remarks.—This species favours swift running mountain streamlets. It agrees with Stebbing's description in the "Challenger Report" of his genus *Atyloides*, except in the inner plate of the second maxillae being apically narrow, and bearing but three plumose setae and not "many." It is specially characterized, in contradistinction to other species of the genus, by the lobed carpus of the gnathopods, and also by the expanded second joints of both the mandibular and maxillary palpi. Three species hitherto have been described, and all of marine habit. They are recorded from the following localities:—Off Cape of Good Hope; near Cape Horn; Kerguelen Island; Port Jackson (New South Wales); Port Phillip Bay (Victoria).

Supplementary Description.

Anterior Lip.—Broad, the end almost straight, and thickly furred with short stout setae.

Mandibles.—That of the left side has the outer plate divided into six teeth, the two end ones being large and subequal, and the four preceding ones smaller; the inner plate is formed of five teeth, the end one being conspicuously longer than the others; the spine row is furnished with twelve stout curved pectinated spines.

The mandible of the right-hand side has six teeth in the outer plate; the inner cutting process is cleft into two ridges, the outer ridge is minutely serrate and the end acuminate, the inner ridge bears two or three small denticles, and ends in two long closely set teeth. The spine row is formed of nine pectinated spines.

The molar tubercle of each is broad at the end, and there is a row of long setae on one side.

The palp is very broad, the first joint short, the second with the inner margin expanded and thickly clothed with long setae, the outer margin somewhat concave, and except at its distal angle is unclothed. The third joint is rather broad, very slightly longer than the second, the inner margin almost straight and densely fringed with short setae, with also a submarginal row of long delicately feathered setae; the outer margin is deeply convex, and bears two bunches of long feathered setae.

Posterior Lip.—The outer lobes are broadly rounded, and thickly ciliated, the inner lobes prominent and apically narrow.

First Maxillae.—The inner lobe is narrow, twice as long as broad, the sides converge to a rounded apex which is furnished with three long stout plumose setae. The outer lobe is broad, and apically bear about nine strongly pectinated spines. The palp has the second joint twice as long as the first, the end rounded and furnished with many feebly pectinated spinules and simple setae; that of the right-hand side is similar to the left.

Second Maxillae.—The inner lobe is almost as broad as the outer, and extends nearly to its extremity, its summit is obliquely rounded, and bears many fine delicately pectinated spinules; these descend for a short distance along the inner margin, and merge into a marginal row of plumose setae that extend to near the base of the lobe. The outer lobe is rounded distally and bears many pectinated spinules.

Maxillipedes.—The inner plate reaches slightly beyond the palps first joint, its truncated end bears three very large triangular teeth, also numerous plumose setae, and two slightly pectinated long blunt spines, and along the inner margin distally there is a short row of plumose setae. The outer plate is narrow-ovoidal, and extends to slightly beyond half the length of the second joint of the palp; the inner margin is minutely serrate,

and fringed with a row of long spine-teeth, which gradually increase in length, and become more slender distally; there is also a parallel row of slender spinules, some of which are minutely pectinated, which extend a very little beyond the apex on the outer margin.

The first joint of the palp is short and has a bunch of setae on the inner and outer distal angles, the second is very broad, sub-ovoidal, almost as broad as long, with the inner surface covered with fine setae, and the outer margin having a bunch of setae medianly, and at the distal angle. The third joint is strongly incurved, only half the width, and rather more than half the length of the preceding joint, the inner surface is unclothed, while the outer bears on the distal half three transverse rows of pectinated setae, the last row of which fringes the whole of the distal margin and almost hides the last joint. The last joint terminates in a pointed unguis, the outer face is unclothed, and the inner is setose. The ultimate and penultimate joints together curve inward and form a half-circle, the nail pointing almost directly hindwards.

Family GAMMARIDAE.

1.—Gammarus australis, sp. n.

(Plate XXXIX.).

Body slender and compressed, back evenly rounded, segments of urosome and last segment of metasome dorsally possessing many long fine spinules. Cephalon as long as the first two segments of mesosome combined, lateral corners rounded, projecting somewhat at the bases of the lower antennae, deeply incised below. Eyes very small, subspherical, black. Coxal plates of anterior four segments of mesosome, deeper than their respective segments, their inferior margins fringed with long spiniform setae, and their posterior margins distally bearing a few short stout spines. Segments of metasome deep, the second with antero-lateral angles rounded, and possessing three submarginal spines, postero-lateral angles right angled, and margins above fringed for a short distance with setae; third segment similar, except that the postero-lateral angles are acute.

Upper antennae somewhat longer than two-thirds the length of the body; peduncle short, extending to the extremity of the penultimate peduncular joint of the lower; flagellum long and slender; secondary appendage with about six articuli. Lower antennae half as long as the upper, clothed with numerous fascicles of very long setae; flagellum of subequal length to the peduncle, and possessing very long setae. Gnathopoda long, subequal in form, clothed with fascicles of long setae, the second slightly longer and the hand rather more swollen; palm slightly oblique, margin straight, entire, setose, defined by two spines, one smaller than the other. Anterior two pairs of peraeopoda short, succeeding three pairs long, the penultimate slightly the longest. Terminal uropoda not long, peduncle short, inner ramus lanceolate, and a very little shorter than the outer, its inner margin fringed with long plumose setae, outer margin with six fascicles of simple setae, and the extremity spinose and setose; outer ramus parallel sided, fringed on the inner margin with plumose setae, and bearing a spine near the extremity, outer margin bearing fascicles of stout spines in four equidistant places, and several long simple setae springing from their bases, the extremity tipped with one very stout spine or rudimentary joint, which is apically setose, and below its base are several spines and setae. Telson cleft to the base, apeces rounded, its outer and distal margins and dorsal surface with fascicles of stiff setae.

Colour.—Spirit specimens uniformly yellowish.

Length.—13 mm.

Occurrence.—Dandenong Creek, near Bayswater (collected by Mr. J. Gabriel).

Remarks.—I have only a few specimens of this interesting form, and am not able to certainly define the sexual characters, but of those received there is no apparent relative difference of size in the second pair of hands. I think it may safely be considered a Gammarus.

Supplementary Description.

Upper Antennae.—The first joint of peduncle is stout, with only a few setae at the distal extremity, the second slightly longer and narrower, with a few setae medianly and at the distal

extremity; the third short and narrow, and only half the length of the second. The secondary appendage in the largest specimen is formed of eight articuli.

Lower Antennae.—These are densely clothed on the upper and under surfaces with bunches of setae, those on the lower margin being very long. The last two peduncular joints are long and subequal.

Anterior Lip.—Very small, stout, distally evenly rounded and setose.

Mandibles.—The left has the outer cutting edge broad, and formed of five, and the inner of three teeth, and the spine-row composed of about nine curved spines which are feathered on their sides that face distally. The right mandible has four teeth in the cutting edge, and a transversely cleft secondary process, so as to form two ridges, each with denticulated edges; the ridge nearest the cutting edge contains seven small teeth, and is limited on one side by a stout pointed prolongation; the inner ridge has about three little denticles, and a similar lateral prolongation to the other. Between this process and the molar tubercle there is a spine-row of three or four feathered spines. The molar tubercles are rather small, and bear a fringe of short setae on one side of the distal margin.

The palp is rather long, the first joint short, the second almost of equal length to the third, and its under surface fringed by bunches of long setae, the third is of normal form and armature.

Posterior Lip.—Principal lobes broad, mandibular processes short and poorly developed.

First Maxillae.—The inner lobe extends to half the length, and the outer lobe to the extremity of the palp's second joint. The inner one is narrow and bears on the inner half of its summit three strong teeth and near their bases are two or three long stiff setae; also, commencing at the distal outer limit is a row of plumose setae which run across to the opposite or inner angle, and descend the margin for a short distance.

The outer lobe is subovoidal, and its inner margin bordered with a fringe of about sixteen spine-teeth, which gradually increase in length to the apex and merge into a row of serrated spinules that descend for a short distance along the outer margin.

The palp is rather long, the third joint as long as the second,

and both are fringed on the inner and outer margins by very many long setae, those of the outer margin being very long; the terminal joint is long, unguiculate, and setose.

Gnathopoda.—The second compared with the first, has the carpus and propodus longer, and also the hind margin of the propodus is convex, and not concave as in the first pair; the carpus of each is of equal length to the propodus, the anterior margin bears five bunches of long stout setae, and the hind margin has very many closely set transverse rows of long setae, some of which in each row are finely pectinated on their edges that face distally. The propodus is oblong, with the palm straight, slightly oblique, and the margin setose; it is defined by two spines, one larger than the other, on each of the inner and outer sides, those on the outer side being almost obscured by overlying setae; like the carpus, the anterior margin bears bunches of fine long setae, the posterior margin is free from setae, but across the outside face, there is set obliquely several transverse rows of long setae, and in addition two or three scattered fascicles. The dactylus seems invariably to bear one stout seta on the outer margin, and with this exception is unclothed.

Peraeopoda.—The first and second pairs are subequal, and are a little shorter than the gnathopods. The basos is as long as the following three joints combined, and has numerous fascicles of rather long setae, as have also all the succeeding joints except the dactylus. The carpus is shorter than the merus, and, in addition to bunches of setae, it has four spines (one long and three shorter) at the postero- and one at the antero-distal angle; its anterior margin with this exception is bare. The propodus is of similar length to the carpus, its anterior margin is bare except at the distal angle, and the posterior margin has a row of four equidistant spines, and also bunches of long setae. The dactylus has a stout spine on the posterior or inner face, near the base of the unguis.

The third, fourth, and fifth pairs are long and subequal in form to each other, the third is a little, and the fifth a very little shorter than the fourth. Their armature is, in general, similar to the first and second pairs, but are more spinose; like the others the dactyli bear a single spine on the inner face near the base of the nail.

Uropoda.—The first reaches beyond the second, and almost to the end of the third; the peduncle is long, extending as far as the end of the peduncle of the second, and its inner and outer upper margins bear about four spines; the rami are subequal, much shorter than the peduncle, and their upper margins and apices are very spinulose. The second pair has the peduncle short and of equal length to the rami; in other respects they are subequal to the first. The third pair and the telson have already been described.

Gen. 2.—**Unimelita,** gen. nov.

Body much compressed, without any dorsal projections. Coxal plates wide and deep, first pair not conspicuously widening distally, fourth the largest, and deeply emarginated posteriorly. Segments of metasome deep. Cephalon without any distinct rostrum, lateral corners obtusely rounded. Eyes rather large. Upper antennae longer than the lower, with small secondary appendage.

Oral parts normal. Inner plate of first maxillae very narrow, and apically bearing only about three plumose setae. Outer plate of maxillipedes with stout spine-teeth. Mandible palp having the ultimate joint not longer than the penultimate one. Gnathopoda subequal, hands small, subchelate, the second scarcely larger than the first, with no conspicuous sexual specialization. Peraeopoda normal, the three posterior pairs with the basal joint laminarly expanded. Branchial lamellae simple. Incubatory lamellae rather narrow. The two anterior pairs of uropoda with rami, subequal, the last pair projecting beyond the others, and having the inner ramus minute and scale-like, the outer one spinulose, and terminating in a rudimentary joint. Telson cleft about half way to the base, end of lobes spinulose.

Remarks.—This new genus is introduced to receive a new species described below, as well as G. M. Thomson's Niphargus montanus from Tasmanian fresh-waters, which I have been enabled to carefully examine through Mr. Thomson kindly sending me co-types. In his original description of it[1], he pointed out divergencies from that genus. The present genus

[1] *Loc. cit.*, p. 26.

has many features in common with Melita but in that genus the second pair of hands is conspicuously larger than the first, and also in the males it is always larger, and frequently greatly larger than in the females. In the two species mentioned above the two pairs of hands are small, the second scarcely larger than the first, and there is no apparent sexual specialization. The coxal plates are relatively much larger and the metasome deeper; there are also some differences in the mouth parts, particularly the first maxilla, which has a very narrow inner lobe bearing not more than three plumose setae. Because of the likeness to that genus, and for the uniformity in the size of the hands, the name Unimelita is introduced.

Unimelita spenceri, sp. n.

Back considerably vaulted. Cephalon deep and as long as the two succeeding segments combined. Eyes large, oblong. Coxal plates of the anterior four segments of mesosome much deeper than their respective segments, the first with lateral margins narrowing distally, the second parallel, the fourth nearly twice as wide as the third, and deeper than broad; the first three pairs with the inferior margins fringed with long setae, the fourth unclothed. Second and third segments of metasome with infero-lateral angles acute, margins entire.

Upper antennae half the length of the body, flagellum not much longer than peduncle, secondary appendage minute. Lower antennae a little shorter than the upper, peduncle long, flagellum short, of about twelve articuli. Gnathopoda of similar form, the second somewhat longer, and the propodus slightly larger; basis, ischium, and merus with postero-distal angle of each furred; carpus trigonal, equal in width to its greatest length, scarcely so long as the propodus, postero-distal margin laterally expanded, furred, and bearing four transverse rows of long simple setae; propodus subquadrate, widening distally, postero-distal half expanded by a furred hyaline border, distal angle rounded, palm transverse, longer than dactylus, insinuate at the place where the end of dactylus closes, margin fringed with about twelve short apically cleft spines, and a parallel row of simple setae, and near the end one very long and two or three shorter

cleft spines; dactylus acute, inner surface with scattered spinules. Peraeopoda long and slender, first two pairs longer than the gnathopods, dactylus of each with three stout spines along the inner face. First pair of uropods of subequal length to the second, third with peduncle short and stout, outer ramus very long, equal in length to peduncle of first pair, inner side with four, and the outer side with six transverse rows of spines, and the distal margin bearing a circlet of apically cleft spines, which almost hide a very short conical rudimentary joint, the apex of which bears three setae and a minute furred spur; inner ramus squamiform, with the apex bearing a few setae. Telson long, deeply cleft, apex of each piece obliquely truncated, and bearing three small spines, and also a few on the dorsal surface.

Colour.—Spirit specimens, yellowish without markings.

Length.—10·5 m.m.

Occurrence.—From amongst spongy moss at the source of a spring running into Wallaby Creek, Plenty Ranges, Victoria. Altitude about 2000 feet. (Collected by J. Shephard).

Distribution.—Lake Petrach, Tasmania. Altitude 2900 feet. (Collected by W. B. Spencer).

Remarks.—This species is named in compliment to Professor Baldwin Spencer, F.R.S., etc. It rather closely resembles Unimelita montanus (Thomson) but is easily identified by deeper coxal plates and by both the terminal uropoda and antennae being much longer. In respect to general features they are in close agreement.

Supplementary Description.

Upper Antennae.—These are rather slender and do not bear many setae; the first and second joints of the peduncle are of subequal length, the third, one-third shorter, and the secondary appendage is two-jointed and not longer than the first joint of the flagellum. The flagellum has about twenty articulations.

Lower Antennae.—The peduncle is rather longer than the peduncle of the upper, its third joint is short, the fourth three times longer, and the fifth is of equal length to the third. The flagellum is formed of about twelve articulations.

Anterior Lip.—This is rather short and broad, with the distal margin evenly rounded and finely ciliated.

Mandibles.—The left has the outer cutting edge divided into four teeth, the inner or secondary edge into four smaller teeth, and the spine row has seven densely plumose spines. The right mandible has the cutting edge of four teeth, the secondary plate cleft into two serrated edges, and the spine row consists of about five spines; on one side of the molar tubercle there is a single very long plumose setae. The palp is long, the first joint short, the second more than twice the length of the first, and the third broad, and slightly less in length than the second.

Posterior Lip.—The outer lobes are widely gaping, the ends almost truncated and bearing a row of twelve stout, blunt incurved spinules, and more proximally many setae; the inner lobes are very short and broad.

First Maxillae.—The inner lobe of each is short, conical, apically tipped with two long plumose setae, and the inner surface clothed with fine simple setae. The outer lobe bears nine denticulated spines. The palp of the left side is divided at the end into five teeth, the outermost one being longer than the rest and it springs from below the base line of the others, also close to the end on the outer side there is a long spinule. The right palp is apically beset with eight simple spinules.

Second Maxillae.—The inner lobe is of equal width to the outer, its inner margin is freely setose, and the summit has very many long fine apparently simple spines and two stouter plumose ones at the inner angle. The outer lobe is apically crowded with very many long curved spines, most of which are simple, but some show slight pectinations under high magnification; the outer margin has one short spinule near the end, and more proximally there is a number of short setae.

Maxillipedes.—The inner plate is rather broad and extends to somewhat beyond the first joint of the palp, and the end is slightly rounded; this has on its inner half three long teeth, and not more than three plumose setae, and on the outer half there are three very long simple spines; along the distal inner margin there is the usual row of plumose setae. The outer lobe is of normal shape and reaches slightly beyond the middle of the second joint of the palp; along its inner margin there is a row of strong teeth which become gradually longer distally, and merge beyond the apex into long slightly pectinated spines.

The palp is rather narrow, the first joint short, and tufted with setae at the outer distal angle, the second narrows slightly distally, its inner margin is thickly setose, the outer margin distally tufted, and at half its length there are a few setae; the third joint is only very slightly shorter than the preceding ones, the distal margin is produced to a conspicuous apically-rounded hyaline plate, the surface of which is thickly furred; along the whole length of the inner margin, also at the apex, the outer distal margin, and at a few places on the upper surface there are long setae. The terminal joint is long and unguiculate, and its inner margin has three stiff setae, and in this respect is similar to the dactylus of each of the pereiopoda.

Gnathopoda.—The first pair of coxal plates have the anterior and posterior margins narrowing distally and merging into the evenly rounded inferior margin which is fringed with numerous long setae and one or two little spines. The coxal plates of the second pair have the anterior and posterior margin straight and parallel, the corners broadly rounded, and the inferior margin straight and setose, and on the posterior rounded corner there are a few short spines.

First Peraeopoda.—These are longer than the gnathopods. The coxal plate is twice as deep as broad the front and hind margins parallel, the inferior margin broadly rounded, and the posterior half fringed with long setae. The merus has a few spinules at three equidistant places along the anterior margin, and the posterior margin has four fascicles of spinules. The carpus has five fascicles of spinules along the posterior margin, and the anterior margin is unclothed except at its distal angle. The propodus has short spines at eight equidistant places along the posterior margin, and the anterior margin has a bunch of long ones medianly and also at the distal angle. The dactylus has three stout spines on its posterior or inner margin, and this is characteristic of each of the succeeding peraeopods.

Second Peraeopoda.—The coxal plate is very large, almost as wide as deep, the anterior margin widening slightly distally, the posterior margin deeply excavated, and the inferior margin very slightly curved and free from setae. In other respects they are similar to the first pair.

Third Peraeopoda.—The posterior coxal lobe is much deeper than the anterior one, and its inferior margin near the apex is serrated and set with six stout spines. The basos is expanded, its width equalling three-quarters of its length, the posterior margin is irregularly and minutely serrated, and the anterior margin is spinulose. The merus has spines at three places along the front and hind margins. The carpus equals in length the merus and ischium combined, and has spines at six places along the anterior, and at three places along the posterior margin. The propodus is of equal length to the carpus, and has spines at seven places along the anterior, and at four places along the posterior margin. The dactylus has already been described.

Fourth and Fifth Peraeopoda.—These are partly broken in my specimens. The coxal lobe of the fourth pair is deeply produced and bears about six acute spines; that of the fifth pair is normally narrow, broadly rounded behind and spinose.

EXPLANATION OF PLATES.

Plate XXXVI.

Hyalella australis, n. sp.

Plates XXXVII. and XXXVIII.

Atyloides gabrieli, n. sp.

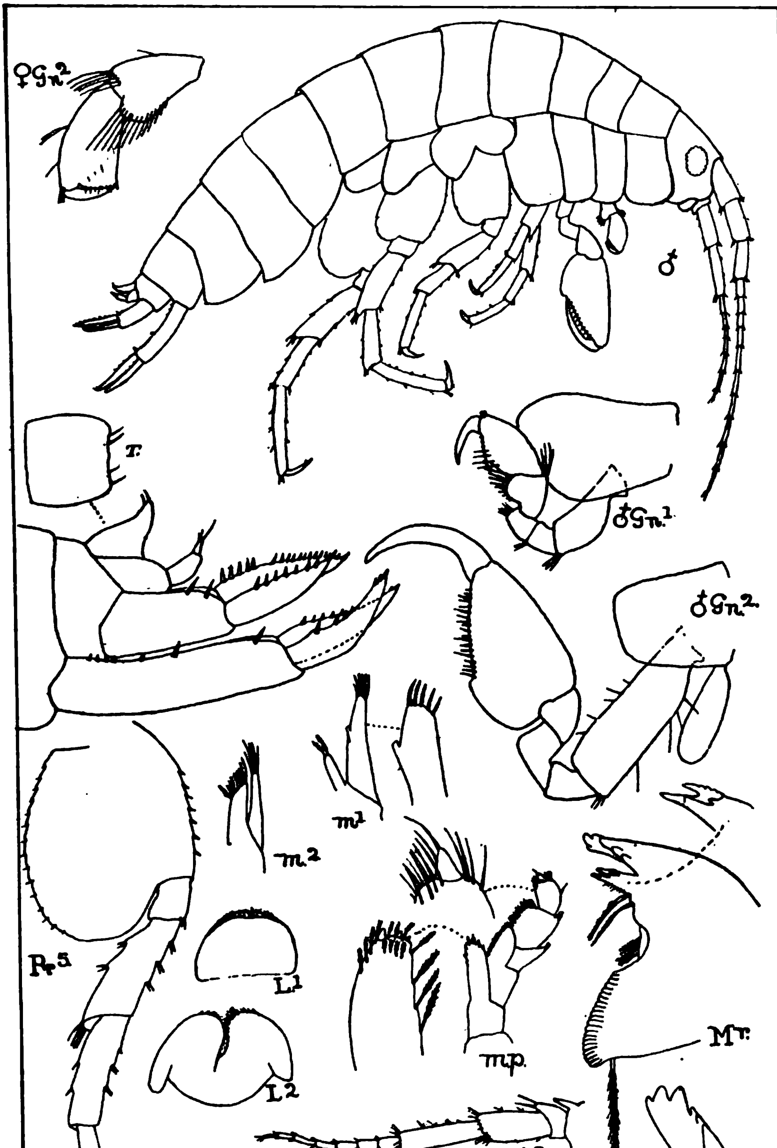
Plate XXXIX.

Gammarus australis, n. sp.

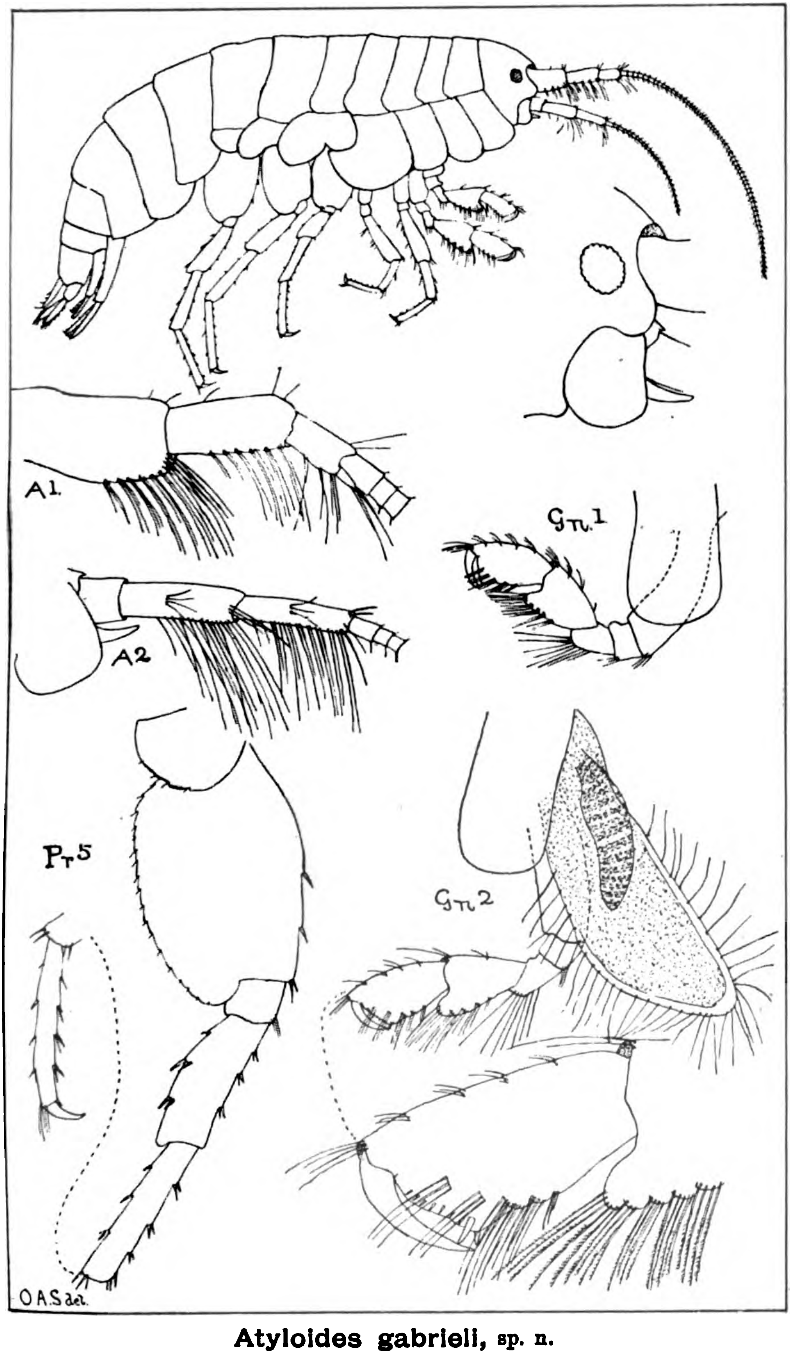
Plate XL.

Unimelita spenceri, n. g. *et* n. sp.

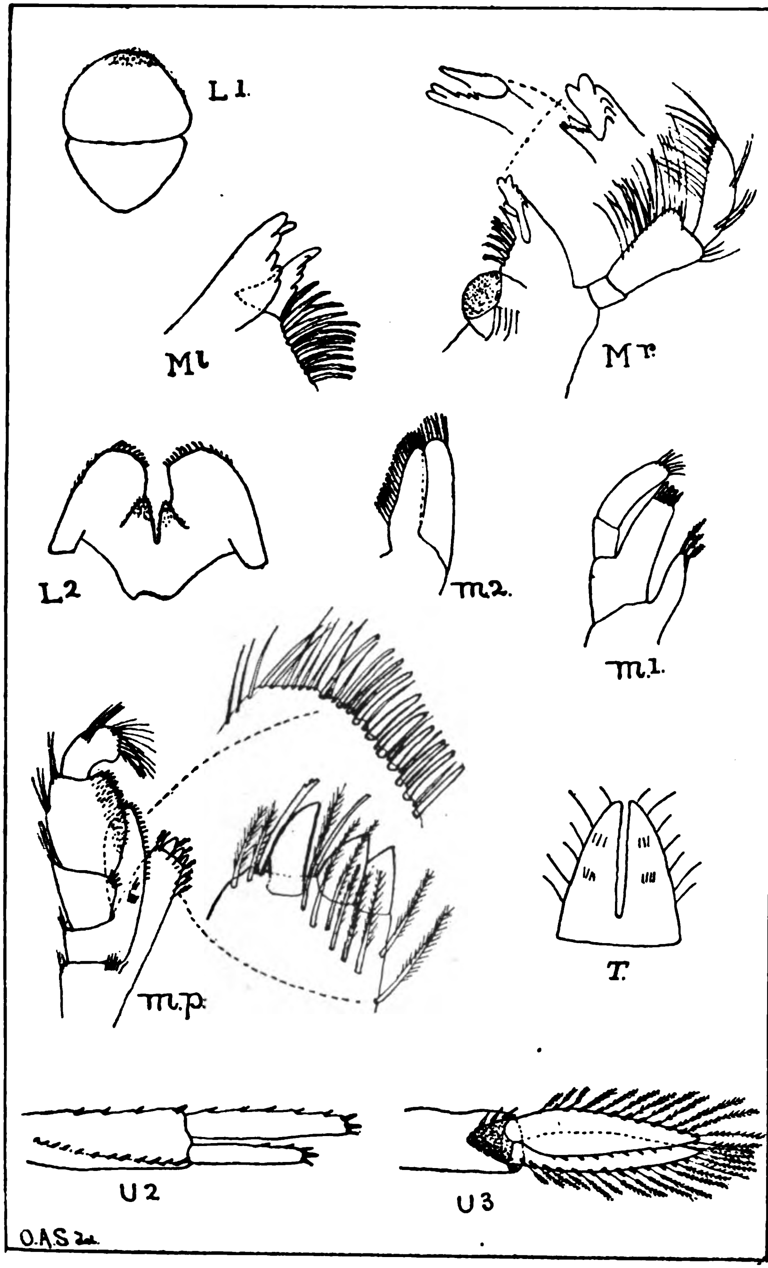
The following lettering is used in each of the plates to designate the corresponding parts:—**C.** cephalon; **Ms.** mesosome; **Mts.** metasome; **Ur.** urosome; **A^1.** superior antennae; **A^2.** inferior antennae; **L^1.** anterior lip; **L^2.** posterior lip; **m^1.** first maxillae; **m^2.** second maxillae; **mp.** maxillipeds; **Gn^1.** and **Gn^2.** gnathopods, first and second pairs; **Pr^1.–Pr^5.** peraeopods, first to fifth pairs; **U^1.–U^3.** uropods, first to third pairs; **T.** telson.



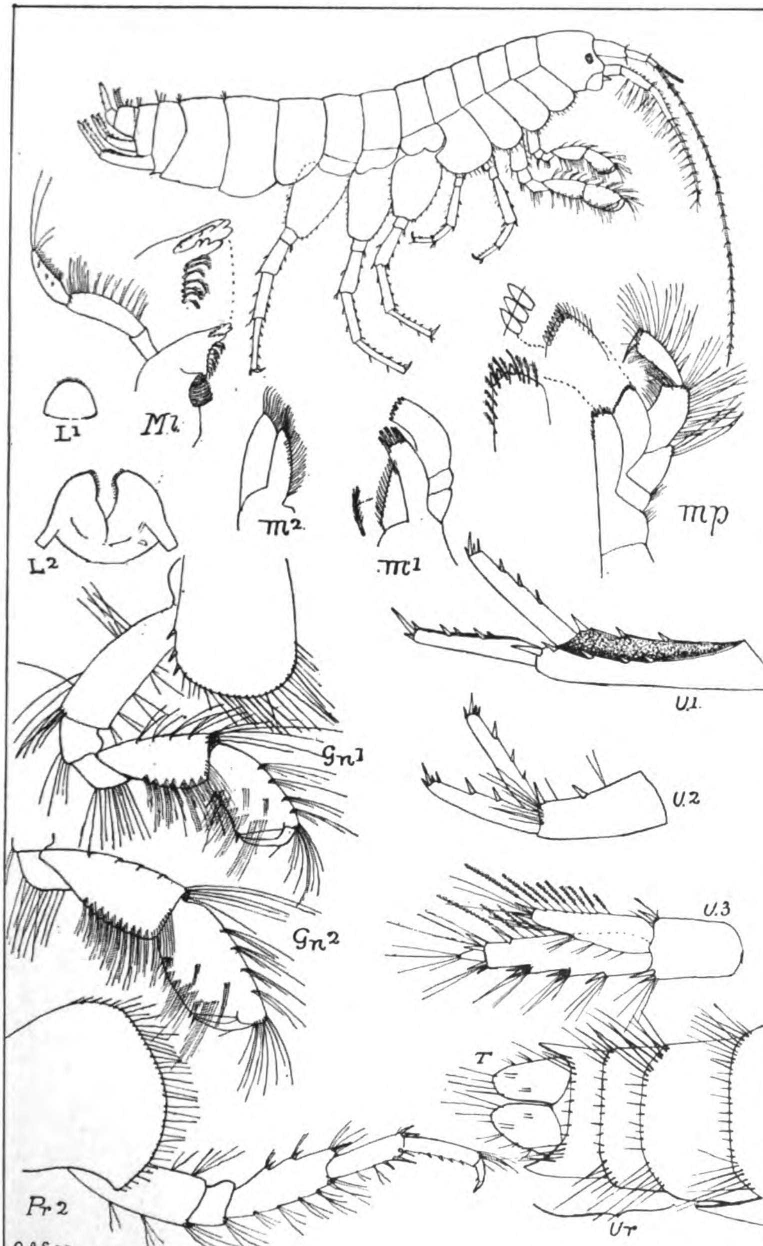
Hyalella australis, sp. n.



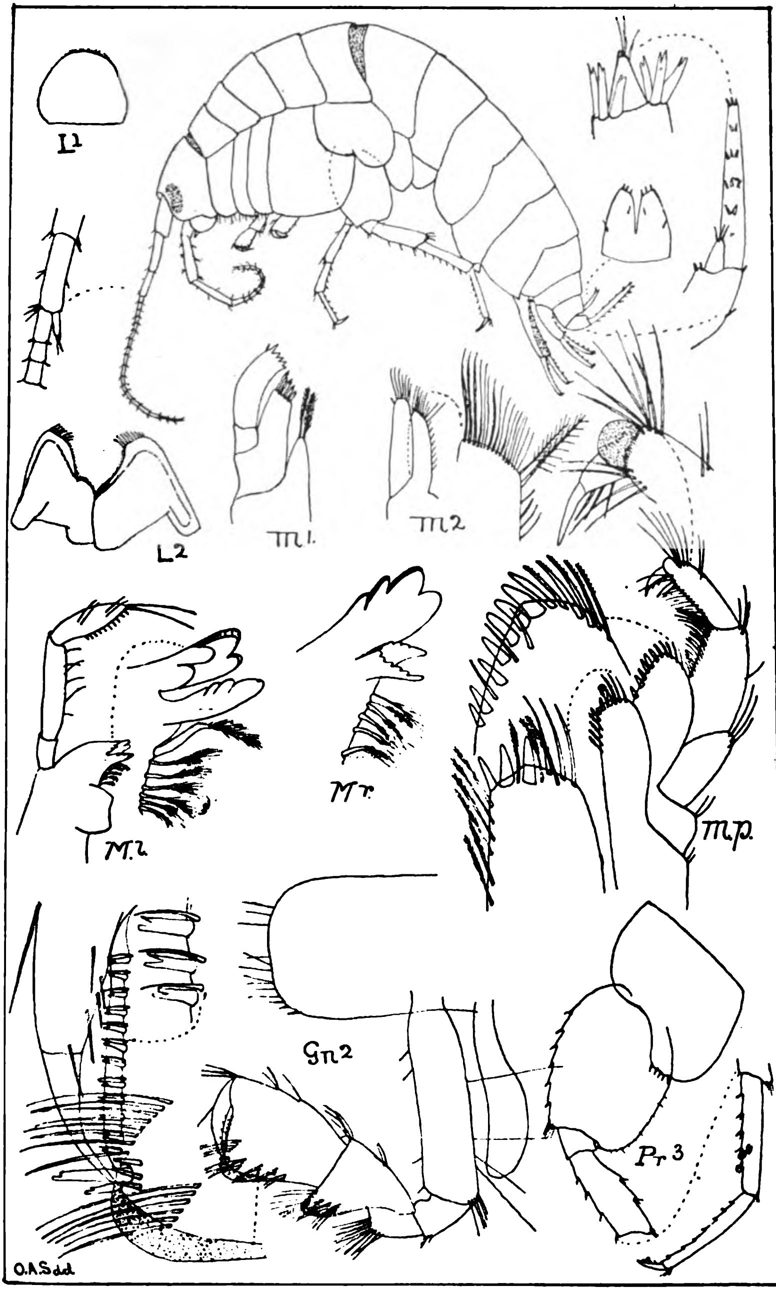
Atyloides gabrieli, sp. n.



Atyloides gabrieli, sp. n.



Gammarus australis, sp. n.



Unimelita spenceri, n. g. and sp.

ART. XVIII.—*Geological Notes on the River Yarra Improvement Sections at the Botanical Gardens and vicinity, Melbourne.*

BY A. E. KITSON, F.G.S.

(With Plates XLI. and XLII.)

[Read 13th December, 1900.]

The notes incorporated in the following paper were made in the year 1898, during the time work was in progress straightening the course of the river Yarra, between Brander's Ferry and Cremorne Street, Richmond. The work was carried out by the Public Works Department on the recommendation of the Floods Prevention Board to prevent the flooding of the low-lying portions of Richmond and South Yarra during heavy rains in the Yarra basin. It was originally intended to carry the works up to the Cremorne Railway Bridge, and it was the hope that the section on the northern side of the river would reveal the relation of the basalt to the shell-bearing marls showing in the cuttings that caused the delay in bringing these notes before the Society. The excavation on the northern side of the river near the Friendly Societies' Gardens did not, as far as noticed by me, afford sufficient evidence regarding this relation, but as the extension of the works referred to has been suspended by the Government there is nothing to be gained by further delay.

The accompanying map of the locality under review, is based upon the contour map of Melbourne and suburbs published by the Department of Lands and Survey, with the Yarra improvements, geological and other information added. The area is embraced in Quarter Sheet No. 1 of the Geological Survey.

The country may be seen from the map to comprise the narrow valley of the Yarra and the bordering Silurian ridges. These ridges are rather steep on the southern side, but rise gently on the northern except near Prince's Bridge where they are much steeper. The southern ridge is covered by the remnant of a

Tertiary series of rocks consisting of gravels, sands, clays, and sandy and ferruginous clays, formerly regarded as of Pliocene, but now as either of Miocene or Eocene age. In the index to the plan I have referred to these beds as Older Tertiary. They form portion of a series of beds that extends across a large part of the Mornington Peninsula and South Gippsland. For almost the whole distance through the locality the river runs near the southern bank by reason of a narrow strip of basalt that occupies the valley. This flow of basalt has apparently filled up the original course of the river and has caused it to impinge against the steep Silurian banks on the south. Probably the basalt reached the foot of these cliffs and necessitated the river having to cut its way through it. But, as the sedimentary rocks would under these circumstances be the more easily eroded the new channel would be formed on the Silurian side, thus accounting for the fact of basalt occurring only in one small patch on the south side of the river.

From Queen's Bridge, which is about 30 chains below Prince's Bridge, the western limit of the map, to past the City of Richmond quarries, some 25 chains above the eastern limit, basalt may be seen in or near the northern bank of the stream for nearly the whole distance. At only one spot, however, as already stated, near the Botanical Bridge, is it noticeable in the south bank.

It appears at the surface either as rounded masses of a few feet in area, as large loose fragments, or under a varying thickness of alluvium as disclosed by shafts and other artificial sections. It is a rather coarse variety and chiefly vesicular and amygdaloidal. The cavities contain the common globular calcite, though in the quarries at Richmond, where there is a thickness of close on 100 feet of this rock, there occur in addition ferrocalcite, aragonite, and various zeolites, such as phacolite, phillipsite, herschelite, and mesolite. Field geology, and the numerous shafts put down by the Metropolitan Board of Works during the last three years in Richmond and Jolimont, in connection with the sewering of the metropolis, show that the basalt extends considerably to the north of Swan Street, Richmond, past the Richmond and Melbourne Cricket Grounds along the edge of the Silurian that embraces most of Yarra Park, round the foot of Jolimont Street,

and up Jolimont Road a little towards Wellington Parade, then, swinging past the front of the East Melbourne Cricket Ground runs parallel with and a little to the south of Flinders Street, past Prince's and Queen's Bridges to the Steam Ferry, Spencer Street. This last record is given in a paper by Mr. Lucas, M.A., B.Sc., F.G.S., "On the Sections of the Delta of the Yarra, displayed in the Fishermen's Bend Cutting."[1]

In the Richmond quarries, where the basalt appears to consist of several flows, the excavations have in some instances passed through the basalt disclosing gravels, sands, and sandy clays of probably fluviatile origin underneath. They apparently represent the old channel of the Yarra. In several places fragments and trunks of trees have been found lying embedded in these sediments. The wood of the trees was carbonised and in parts filled with pyrite. The basalt extends some miles further up the valley of the Yarra to Dight's Falls, and connects with the flow that came down Merri Creek, and the sheet that forms the gently sloping country from the Merri Creek to Alphington. In the City of Melbourne Corporation quarry, also, on the western bank of Merri Creek, at Clifton Hill, there is a thickness of about 100 feet of basalt. Trunks of small trees and pieces of wood, all carbonised, were found in the sediments underlying. The basalt in this quarry is exceptionally rich in zeolites, and various forms of carbonate of lime, and some dazzlingly beautiful specimens are from time to time revealed by the operations carried on. In one instance a small chamber in the basalt was broken into and found to be resplendent with innumerable clusters, bunches and single crystals.

Though in these quarries the basalt is so thick only one flow appears to have extended down as far as the Botanical Gardens and Queen's Bridge. In the former locality on its northern fringe it is covered by several feet of grey clay derived from the Silurian rocks. Thus in shafts at the corner of Jolimont Street and Jolimont Road there is a thickness of six feet of brown and grey plastic and sandy clays lying on the basalt; in Wellington Parade, opposite the East Melbourne Cricket Ground, 18 feet of clays on the basalt; while at the corner of Jolimont Road and

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1 Proceedings of the Royal Society of Victoria, vol. xxiii., 1886.

Wellington Parade, 15 feet of clays lie on Silurian claystones. The basalt has not been pierced in any of the shafts hereabouts. In parts of Yarra Park the basalt is covered by only a few inches of sandy alluvium, and along the fringe of the river, basalt may be seen in several places running to the edge of the stream, though not visible in the bank.

From being only a few chains wide at each end of the area under review the basalt reached a width of about 30 chains in the middle. Whether the whole of this flow came down through the narrow neck east of the Cremorne Railway Bridge, or some of it over the low Silurian rise between East Richmond and the railway is not apparent.

The Silurian rocks form interesting sections near both entrances to the Botanical Gardens from the Yarra side, and also from the Old Pumping Station to near the Engineers' Depot. Here a fine section discloses what appears to be a local example of quaquaversal dip, and two interesting dykes. These are quite distinct in character from each other. The more eastern one, which is about 3ft. 6in. wide, and bearing north and south obliquely across the beds, dips about W. at 60°. It is so decomposed that its original character is not detectable. It has the appearance, however, of having been of a mica felspathic nature, and black mica (biotite) is still visible though mostly decayed, giving the rock a rusty brown color. The beds on the foot wall are considerably crushed and twisted for a few feet back from the dyke. The other and much larger dyke has been intruded along the bedding plane of the strata, and stands out prominently in color from the containing beds. From a short distance it appears to be one of the beds themselves, but closely examined it is seen to have entangled in it two small blocks of the sediments which show in such a pronounced manner that there is no mistaking the fact. The dyke rock is a fine-grained white granular one of apparently quartz and some glassy felspar, the latter predominating.

The strata here dip generally S. 70° W. at angles varying from 53° to 58° to the west of the dome, and N. 35° E. at from 30° to 35° to the east of it. In the section near the western Yarra entrance to the Botanical Gardens the rocks dip from W. to S. 80° W. at from 29° to 39°, while at the eastern entrance the dips

are S. 70° E. to S. 85° E. at from 72° to 75°. The rocks are claystones, mudstones, and fine hard sandstones. Some of them contain casts of fossils in fair number though few of them are in even a fairly good state of preservation. Brachiopods, like Atrypa and Cephalopods as Orthoceras are rather plentiful, and there also occur a few Trilobites. One of the last named, Cyphaspis spryi, found by Mr. F. Spry has recently been described by Professor Gregory, D.Sc., F.G.S., before this Society.

Now, taking the Yarra Improvement sections, we have first that on the north side of the river. This cutting forms a slight curve with a length down the middle from stream to stream of about 14 chains. On the occasions of all my visits basalt was noticeable on the north side only, and that, some distance away from the western end of the cutting. This western portion consisted solely of dark alluvium with remains of vegetable matter such as roots of reeds, etc., in the upper portions, merging into bluish-black marl in the lower, with a few shells in the layer on the floor of the cutting. About 60 yards from the western end of the section, commencing at the top, was basalt—thickness not ascertainable; dark alluvium with roots, 12 feet; bluish-black marl with few shells about 3 feet. There is no evidence to show the relation of the basalt to the shelly marl, though, at first sight, it appears to be overlying the sediments. It may be mentioned, however, that all my visits here were after the cutting had advanced past this point, and the slope had been trimmed and covered with material from the floor of the cutting, therefore, no good opportunity was afforded of satisfactory observation. Neither have I as yet been able to obtain any reliable information on the matter from those engaged on the work.

Taking a section near the east end (see Section A), the following, in descending order, were seen: greyish alluvium, getting gradually thicker as followed northwards, 3 feet 6 inches to 5 feet 6 inches; whitish alluvium, with fragments of roots, 3 feet 2 inches; black fissile clay, with three thin laminae of comminuted shells and lenticles of pure sand, 3 feet to 4 feet 6 inches; greenish-grey clay, the upper portions being intersected by numerous little cylindrical bodies consisting of the overlying black fissile clay, 1 foot; reddish-yellow sandy clay with greyish-white streaks from top of stratum to some distance into it, 5 feet

to 7 feet; vesicular and amygdaloidal basalt, much decomposed, 8 to 12 feet, not penetrated in the floor of the cutting. The shells in the black clay were apparently all of lamellibranchs, but were so much broken up that those sufficiently preserved to allow of a hope of identification were very few. A small collection of the material was made from several portions, but it has unfortunately been mislaid. I regard this bed, however, as distinct from the shelly marl, and it directly overlies the basalt in one place. It may be the littoral portion of the estuarine deposit of which the shelly marl forms that laid down in deeper water. The greenish-grey clay extends only partly across the cutting, and the cylindrical bodies in it were probably worm burrows which were filled up with the overlying material.

In a section right at the end of the cutting (Section B), and about 4 feet from the river's edge, the strata showed as alluvium 2 to 3 feet; black fissile clay with fragments of the same kinds of shells as in the preceding section, not in distinct layers, but distributed through the clay except at the south end where they occur as a distinct layer lying on the sandy clay, 5 feet; yellowish sandy clay, 10 feet thinning to 5 feet going south; ferruginous quartz grit, 9 inches; ferruginous cemented conglomerate containing pebbles of quartz, sandstones, shales and basalt, 4 inches to 1ft. 6in.; basalt varying from 5 feet to 10ft. 6in., thinning towards the south. The conglomerate occurs as patches or thin bands and lies in eroded hollows of the basalt.

A small bed, 6 inches thick, of clayey gravel of quartz, shales and sandstones underlying bluish-black clay occurred about 50 yards from the east end of the cutting. It was 2 feet above the floor of the cutting and on the river (south) side of it.

From these sections it will be noticed that the shelly marl does not show in this north cutting for more than half way from the western end and it appears to trend in an oblique (S.E.) direction across it. This points towards the assumption that the cutting at its eastern end runs through the margin of the old estuary.

South of the Yarra the cutting was made through the corner of the Botanical Gardens and extended across the foot of Anderson Street until it met the river again 6 chains to the east. No basalt was met with in any part of this cutting, though

according to Mr. Catani, Engineer for Roads and Bridges in the Department of Public Works, basalt "boulders" were found in the cutting on the east side of Anderson Street.

In the western portion (Section C), the deposits were alluvium for varying thicknesses up to 7 feet; bluish-yellow and dark grey sandy clays and fine sand, 4ft. 6in. to 5ft.; dark bluish-grey clay with roots, 4 feet to 6ft. 6in.; bluish-grey marl with thin sandy layers and containing shells, 4 feet and upwards. The shells in this south cutting are not in such quantity, though in greater number of species than in the north cutting.

It may be mentioned, however, that a larger collection of shells was made in this cutting than in the other, which probably accounts for the fewer species recorded from the latter.

The following is the list of shells obtained, and I am indebted to Mr. J. H. Gatliff for kindly naming them:

Lamellibranchiata.	Gastropoda.
Chione sp.	Nassa pauperata (Lamarck).
Mytilus sp.	*N. labecula (A. Adams).
*Mactra sp.	*Cyclostrema micans (A. Adams).
Ostrea? juv.	= Liotia angasi (Crosse).
*Tellina deltoidalis (Lamarck).	*Natica plumbea (Lamarck).
Cardium tenuicostatum (Lamarck).	
Barnea australasiae (Gray).	**Crustacea.**
Venus laevigata (Sowerby).	
*Arca trapezia (Deshayes).	*Balanus (?) sp.

Note.—Those marked with an asterisk are from the north cutting only, the whole of them being found in the south cutting.

The shells occurring in profusion in the Botanical Gardens were Nassa, both species, and Tellina deltoidalis. Arca trapezia was scarce, while in the north cutting it was fairly plentiful. Natica plumbea was in fair number in both.

The eastern end of the cutting passed through the point of Silurian which had diverted the river a little to the N.W., and exposed an interesting section on the north side of the cutting. Here, at normal water level, may be seen the remnant of a 5 inch layer of brecciated conglomerate resting on the Silurian.

The lower portion consists of flattened, rounded and subangular pebbles of the local mudstones, claystones and sandstones; the upper portion of rounded pebbles of these rocks and of quartz in addition. All these pebbles are cemented together by slightly ferruginous sand. Overlying these are yellow, red, and white mottled fine sandy clays or clayey sands. This conglomerate is undoubtedly of local origin and derived from the Silurian rocks, while that in the east end of the north cutting is also local, but derived from both Silurian and basalt, thus, apparently, showing that the stream which made the pebbles ran between these two points over the contact of these two rocks, and, therefore, along about the same course as the present Yarra. The single outcrop of basalt south of the river occurs a few yards north of the point where the conglomerate is visible, but its relation to this band cannot be seen owing to the debris from the Silurian rocks from the cutting that has been piled on to it.

After getting through this Silurian point into the river in the south cutting, work has been extended only a short distance further up stream by slicing a strip of the southern bank for about 100 feet back from the river. In this portion, where work has been suspended at the Punt Road foot bridge, the excavation is only about 12 feet deep. About 8 feet of the upper portion is simply ordinary alluvium, but 4 feet on the bottom contain a few large pieces of carbonised wood and other fragments of vegetation. No basalt or shell marl are visible here.

The recent deposits in the south cutting presented some rather interesting features. In the alluvium and marl there are numerous very thin layers or partings, varying from a thread to ½ inch in thickness, having a pronounced dip, ranging from N. 60° W. to N. at from 7° to 9° 30′. These layers on being examined proved to be very fine white sand, the marl caking off in a clean manner when disturbed. Most of them had white exudations of salt and what appeared to be magnesium chloride and in several cases small fragments of barnacles were visible. Shells were sparingly interspersed through the lower portions of the marl and small patches of barnacles occurred. The changing dip of the beds on the north side of the south cutting seems to indicate that they were laid down over a small rise by a gentle current not strong enough to cut through them and cause current bedding.

In the floor of the cutting two small springs were throwing out fine black sand and colorless water having a strong smell of sulphuretted hydrogen. The bubbling of one spring was distinctly audible a few yards away. Down the face of the slope of the bank on the south side there was a considerable percolation of water highly charged with iron, which left yellow, red, and brown deposits of chloride and oxides of iron. This was also a noticeable feature in the cutting on the north side and the colorless water which occurred there also was asserted by the workmen to have a poisonous effect on any skin abrasion with which it came into contact. In the portion in the south cutting nearest the new bridge in Anderson Street, the shells occurred in a distinctly stratified bluish-grey micaceous clay containing remains of reeds, wood, and masses of black vegetable mould without shells, which crumbled to powder on rubbing when dry. The mica has probably been derived from some dyke containing that mineral. A dyke of a granitic nature must occur somewhere in the vicinity, as rock of that kind was noticed in the material used for making the embankment on the Botanical Gardens side of the cutting, and this material was said by one of the workmen to have come from about the southern abutment of the bridge.

The similarity of these mineral water exudations from the sides of the cuttings to those described by Mr. Lucas from the Fishermen's Bend cutting is very great, and it is also a noticeable fact that the upper portions of the deposits in both places contained no animal remains of any kind. The nodules, however, so prevalent in the West Melbourne estuarine deposits, were not noticed in these.

The occurrence of these shelly marls so far up such a narrow valley as this of the Yarra is a feature of especial interest, more so on account of the narrow entrance to it at Prince's Bridge. There seems little doubt that this estuarine deposit under alluvium, as in the locality under notice, extends over a considerable portion of South Melbourne, and that the old course of the Yarra was to the S.W. through what is now Albert Park Lake running into Port Phillip somewhere between Albert Park and St. Kilda Railway Stations.

On the evidence furnished by these Yarra sections it appears as if the estuarine deposits may be provisionally regarded as

extending little, if any, higher up the river than the east end of Anderson Street cutting.

The section in the north cutting shows apparently that the basalt margin occurs in the cutting not reaching the south side except at the south-east end, and that the shelly marls were deposited against its side. Over these the river brought down quantities of alluvium, which accounts for the absence of marine shells and presence of roots and vegetable matter. There does not appear to be any unconformity between the alluvium and the shelly marl, the latter grading off into alluvium as the land was gradually raised and brackish and fresh water took the place of salt water.

The age of the basalt is, however, still a moot point. If it be regarded as overlying the shelly marls then its age is much younger than generally supposed, and brings it nearly to recent times, since the shells found in the marl are identical with, or but very slightly different from, those now living in the Bay.

DESCRIPTION OF PLATES XLI. AND XLII.

PLATE XLI.

Geological map of the Yarra Valley near the Botanical Gardens, Melbourne.

PLATE XLII.

Geological sections to illustrate map.


Yarra
Heights
SCALE
Silu

Art. XIX.—*Additions and Corrections to the Census of Victorian Minerals.*

By R. H. WALCOTT, F.G.S.

[Read 13th December, 1900.]

Introduction.

The following mineral occurrences, with the exception of the meteoric minerals, previously unrecorded, will materially supplement the list of Victorian minerals prepared by Mr. J. A. Atkinson in 1896. The balance of occurrences not included in these two lists will be found in the annual reports of the Department of Mines from the year 1896 and in "An introduction to the study of Mineralogy" by F. M. Krausé, 1896. Advantage has been taken of this opportunity to correct some wrong determinations made in the past, and which might otherwise become perpetuated. I was enabled to do this with the assistance of Professor G. H. F. Ulrich of the Otago University School of Mines and Mr. O. R. Rule, late of the Technological Museum, to whom I am consequently greatly indebted. With regard to some of the old records, although of very doubtful authenticity, it is now difficult or impossible to either verify or disprove them, they must therefore be accepted as correct. A difficulty is also experienced in obtaining exact localities, more especially if specimens have any economic value, and in many instances the information cannot be relied upon, as samples frequently get confused and likewise their localities. Owing to this, some occurrences have been omitted, the information being palpably incorrect. A matter neglected in the past, and which deserves more attention, is the analyses of mineral species. Many minerals can only be determined by such means, and in its absence specimens have to be set aside, relegated to permanent obscurity, or else exhibited under a provisional name, a proceeding eminently undesirable. In this way interesting and perhaps new minerals are lost to science.

At times supposed new species are named and described on the strength of a blow-pipe examination, an analysis evidently being deemed unnecessary. Needless to say this practice is objectionable and it only helps to make confusion where elucidation is desired, creating species out of varieties and mixtures. The method of keeping mineral records is extremely unsatisfactory, if indeed there is any general system in existence. A proper system can only be carried out by the co-operation of the Geological Survey with the various Schools of Mines and Museums, which are the main channels through which mineral specimens pass.

The keeping of a complete record of mineral occurrences should form part of the different officials' duties and who should from time to time forward their information for registration at headquarters. If this were properly done and full and reliable particulars given, it would not only prove of scientific interest but would form a valuable record from an economic point of view. To Messrs. D. Clark and F. Stone my thanks are due for the trouble they have taken in providing me with lists of the various occurrences which have come under their notice, and also to Mr. T. S. Hart for preparing a list of the specimens in the Ballarat School of Mines Museum.

Abbreviations.

B.M.—Specimens in the School of Mines Museum, Ballarat.

M.Dt.—Determinations made in the Mines Department Laboratory and not recorded in the Annual Reports.

Cl.—Determinations made by Mr. D. Clark.

U.—Information received from Professor G. H. F. Ulrich.

R.—Information received from Mr. O. R. Rule.

W.—Determinations made by the writer.

F.—N. Flight. Philos. Trans. Royal Soc., 1882, pp. 887–894.

C.—Prof. E. Cohen. Sitz. K. Preuss, Akad. Wiss. Berlin, 1897.

*—Specimens in the National Museum Collection.

§—Minerals recorded for the first time.

List of Minerals.

Albite.—Soda felspar.

Associated with ankerite in silurian slate, Sulieman Pasha Mine, Ballarat East; associated with ankerite, quartz, pyrite, etc., in silurian slate and sandstone, Band and Albion Mine, Ballarat (B.M.).

Anglesite.—Lead sulphate.

A nodule of galenite with a grey massive crust of anglesite mixed with a little cerussite. Upper Silurian limestone, Lilydale (W.).

Apatite.—Chloro-phosphate of calcium.

Small greenish-yellow hexagonal crystals in a tourmaline granite, hills near Seymour; long hexagonal crystals from the older basalt, Westernport (W.).

Apatite was first noticed in the basalt of Phillip Island, but, owing to the similarity of form, was for some time taken to be Nepheline, and consequently it is recorded as this mineral in some of the earlier catalogues. The correct determination was due to Mr. O. R. Rule.

Arsenopyrite.—Sulp-arsenide of iron.

Small simple crystals enclosed in a clear quartz crystal (endomorph), Blackwood (W.). This mineral has such a general distribution that it is useless attempting to record all its occurrences. It is almost as prevalent as pyrite, and occurs in much the same manner in many of our quartz reefs, and also in some of the auriferous dyke rocks when it appears at times in long fine, prismatic crystals.

Arsenolite.—Arsenic trioxide.

All occurrences are artificial and result from the condensation of arsenic oxide, when arsenical ores (arsenopyrite mostly) are being calcined prior to chlorination.

Asphaltum.—

In small rounded pieces with roughened exterior. Found on the beach of Bullenmerri, near Camperdown.

Augite.—*var.* of pyroxene.

Acicular crystals in a druse of dolerite, Miners' Racecourse, Ballarat (B.M.).

AXINITE.*—Boro-silicate of aluminium and calcium with more or less iron and manganese.

Pale lavender-pink coloured crystallizations associated with epidote from small veins in the diorite, Samaria, Mansfield district (M.Dt.).

BARITE.—Barium sulphate.

Semi-transparent and imperfectly crystallized masses, Corryong; massive crystalline, Mount Tara (W.).

Large lodes of almost pure barite occur in porphyry, at Gelantipy, they are slightly argentiferous; Clifton Creek and Mount Taylor Creek (Cl.).

BERTHIERITE.*§—Sulphantimonite of iron.

No quantitative analysis of this specimen was made, but in other respects it agrees closely with berthierite. It occurs near Euroa in a quartz lode in small fibrous veins with iridescent surface (W.).

BEUDANTITE.—Hydrous phosphate or arsenate of iron and lead.

The mineral recorded as beudantite is pharmacosiderite, the mistake being due to similarity of form (R.).

BISMUTH.—

In small patches in a crystalline quartz reef, Mount Taylor; oxide, sulphide, and carbonate of bismuth, with traces of tellurium, Mallacoota (Cl.).

BISMUTHITE.—Bismuth carbonate.

Mount Taylor; in ironstone, Mallacoota (Cl.).

BORNITE.—Sulphide of copper and iron, Mount Tara (Cl.).

BOURNONITE.—Sulphantimonite of lead and copper.

Disseminations in quartz with pyrite and arsenopyrite, Mount Wills (W.). Long Tunnel Mine, Walhalla (Cl.).

At Anderson's Creek this mineral occurs in some of the quartz reefs. It is generally surrounded by a yellow powdery decomposition product which, probably consists of lead sulphate and antimony oxide. As far as experience goes bournonite is either non-auriferous, or only auriferous to a slight extent.

CALCITE.—Calcium carbonate.

var. Stalagmite.—Granular botryoidal, caves at Yering; banded concretionary; Back Creek, Gippsland (B.M.).

var. Calcsinter.—Loch Ard Caves, near Port Campbell (B.M.).

var. Manganocalcite (?)—Carbonate Gold and Silver Mine, Buchan. Pink in colour, blackens before the blow-pipe, and gives reaction for manganese. Analysis (Cl.):

Lime	49·77
Manganese oxide	4·84
Ferrous oxide	1·00
Magnesia	·25
Carbonic dioxide	43·11
Insoluble residue (Barium sulphate)	·82

Analysis of dark blue, massive limestone from Buchan (Cl.):

Lime	53·34
Magnesia	·48
Water	·32
Iron, alumina, and phosphorus pentoxide	·31
Insoluble residue	·98
Carbonic dioxide and hydrocarbons	43·67
Organic matter (fixed)	·90

The sample gives a disagreeable odour when struck or rubbed and only traces of sulphuretted hydrogen were evolved.

CASSITERITE—Tin dioxide.

Tarago River, South Gippsland; Boggy Creek (Cl.).

Analysis of picked crystals from Mount Taylor Creek (Cl.):

Tin dioxide	94·05
Silica	5·20
Ferric oxide	·75

No tungstic acid present.

CERARGYRITE.§—Silver chloride.

Surface of United Brothers' Mine, Glen Wills; Monte Christo Mine, Bullumwaal (Cl.).

CERUSSITE.—Lead carbonate.

Highland Chief Mine, Brookville (Cl.). With galena and anglesite, Upper Silurian limestone, Lilydale (W.).

CERVANTITE.—Antimony oxide.

Incrusting stibnite in quartz, Burgoyne; massive crust on coarsely crystallized stibnite, Alexandra District; with stibnite, 14 miles from Euroa (W.). Cervantite

usually occurs as a massive or powdery crust on stibnite and no crystals have come under my notice (W.).

CHABAZITE.—Hydrous silicate of aluminium, calcium, sodium and potassium.

Narre Warren (R.).

CHALCOPYRITE.—Sulphide of copper and iron.

Occurs associated with galena in a small quartz vein at Steele's Creek (W.). Mount Tara; Cassilis (Cl.).

The occurrence of chalcopyrite in quartz veins is frequently noticed, more especially in the eastern part of the colony. It is often auriferous and sometimes very rich.

CHIASTOLITE.—*var.* of ANDALUSITE.

Imperfectly formed crystals evenly distributed through a siliceous slate, Thoona. Probably formed by contact metamorphism (W.).

CHROMITE.—Chromium sesquioxide and iron protoxide.

In grains and octahedral crystals, Jack's River, Alberton (W.). Black and massive, Corryong (M.Dt.).

CINNABAR.—Mercury sulphide.

Found in small broken fragments on the surface near a quartz reef, near Bullumwaal, Gippsland (M. Dalton).

COCCOLITE.—*var.* of AUGITE.

The mineral recorded under this name is only common black augite (U.).

COHENITE.—A carbide of iron and nickel.

The physical properties of cohenite and schreibersite are very similar, so that they are not easily distinguishable. They are both less brittle, and their cleavage is not so marked as in other meteorites. Beaconsfield Meteorite (C.) Analysis :—

	1	2	3	4
Iron	—	88·66	91·62	90·94
Nickel	—	3·81	2·24	2·22
Cobalt	—	0·30	0·30	0·30
Carbon	5·51	—	6·59	6·54
Phosphorus	—	1·45	—	—
Residue	16·32	—	—	—

In Nos. 1 and 2 some schreibersite is present. Nos. 3 and 4 are calculated without schreibersite. The specific gravity, 7·2014, appears to be lower than usual, and remains so after allowing for a 13.06 per cent. mixture of schreibersite. See note under taenite.

COLUMBITE.—Columbate and tantalate of iron and manganese.

The mineral recorded as columbite from Maldon, has since been proved, by Mr. Rule, to be a ferriferous variety of Rutile. This error arose through the quantity available being very limited, and the chemical reactions mistaken for those characteristic of columbium, and also from the fact that the crystals were very small, and twinning gave them the appearance of belonging to the orthorhombic, instead of the tetragonal system (U.).

COPIAPITE.—Hydrous iron sulphate.

Earthy, Bull's Well, Jan Juc (B.M.).

CORUNDUM.—Alumina.

Rolled fragments, some ferruginous and some passing into diaspore, Beechworth (B.M.). In nearly all the creeks as a grey sand, blue sapphires generally occurring with it, the largest measured $\frac{7}{16}$ of an inch across, and is of a navy blue colour, Mitchell River, Boggy Creek, Wentworth, Swift's Creek (Cl.). Rounded fragments of a greenish colour, Garlick's Lead, Trentham (W.). Corundum in all its varieties but the ruby, which is rare, is commonly met with in the water courses in, and alluvial deposits derived from, eruptive and metamorphic rocks. Much of the so-called black corundum is only pleonaste.

DAUBRÉELITE.—Sulphide of chromium and iron.

Surrounding some of the nodules of troilite, Cranbourne, No. 1 Meteorite (F.). In the Cranbourne No. 2 Meteorite, two patches of troilite are surrounded by schreibersite, and a black mineral which is probably daubréelite (W.). See note under taenite.

DIAMOND.—Pure crystallized carbon.

Octahedron of a pale yellow tint, found in a wash containing tourmaline, amethyst, mica, quartz crystals, etc., Cong-

bool, Black Range (W.). The stones found are said to measure about $\frac{3}{8}$ of an inch in diameter. It is also reported that rubies and sapphires were likewise found, but too small to be of value. (See *Argus*, 27th April, 1895).

DITTMARITE.—

A very doubtful mineral species (R.).

DOLOMITE.—Magnesium carbonate.

Small, white, flat rhombohedra with rounded faces, the whole forming a small cavernous mass, from the basalt, Bung Bung* (W.). White nodular masses, Swift's Creek (Cl.).

EDMONDSONITE.—A meteoric nickel-iron.

This alloy forms thin paper-like pliant plates, which lie on the faces of the tetrahedra of nickel-iron. They are in the form of equilateral triangles, or are lozenge-shaped, and have the thickness of stout writing paper. Fresh plates taken direct from the meteorite contained 0.688 per cent. of phosphorus. Cranbourne No. 1 Meteorite (F.).

Iron - - - -	70·138
Nickel - - - -	29·744

See note under taenite.

ELECTRUM.—Alloy of gold and silver.

Granular in quartz, Wood's Point (B.M.).

EPIDOTE.—Silicate of aluminium, calcium and iron.

Small green, imperfect crystals associated with axinite in diorite, Samaria, Mansfield District* (W.). Greenish veins with reddish coloured walls in diorite, Noyang and Charlotte Spur (Cl.).

FLUORITE.—Calcium fluoride.

Small veins above the weir, Mitchell River (Cl.).

GALENITE.—Lead sulphide.

Large cubical specimens, Gum Forest and Martha Vale near Mt. Baldhead on the Nicholson River (Cl.).

Analysis of galenite from Martha Vale (Cl.):

Lead - - - - -	85·84
Iron - - - - -	·27
Copper - - - -	·18
Silver - - - -	·06
Sulphur - - - -	13·82

Contains slight excess of sulphur which it evolves when heated in closed tube.

GARNET.—*var. Almandine.*

Crystals in the granite of Mount Taylor. The creeks below contain them in large quantities (Cl.).

GÖTHITE.—Hydrous sesquioxide of iron.

Limestone Creek, head of Murray River (Cl.).

GRAPHITE.—Carbon, mostly impure.

Rather earthy; evidently from a small vein, Riddle's Creek (M.Dt.). Coating metamorphic slate, Stawell (B.M.). Occurs surrounding troilite and as independent masses. Cranbourne No. 1 Meteorite (F.); Beaconsfield Meteorite (C.); Cranbourne No. 2 and Langwarrin (W.).

Analysis of Cranbourne No. 1:—

Carbon - - - -	89·661
Hydrogen - - -	0·257
Residue (iron, etc.) - -	10·412

GYPSUM.—Hydrous calcium sulphate.

Pulverulent. Bridgewater on Loddon (B.M.).

var. Selenite (B.M.). A group of crystals with somewhat convex and pitted faces, single crystals of common form plentiful, Sewerage works, Hannah Street, South Melbourne* (W.).

HEMATITE.—Sesquioxide of iron.

var. Micaceous.—Soft and very micaceous, near Mount Wills* (W.).

var. specular.—In hexagonal plates in a druse in basalt with labradorite and calcium carbonate, Batesford, near Geelong (W.).

Tabular crystals with labradorite in dolerite, Redan, Ballarat (B.M.). Specular iron in basalt may be regarded as a primary constituent.

HERSCHELITE.—*var.* of Phacolite.

The occurrences recorded under the name of herschelite should be placed under phacolite, because Victor von Lang, at that time of the British Museum, was misled by insufficient analyses and crystallizations (U.).

HORNBLENDE.—*var.* of Amphibole.

Massive outcrop, Glenmaggie (Cl.).

Kamacite.—See note under taenite.

Kermesite.—Oxysulphide of antimony.

Coating massive stibnite, Tallandoon; fibrous radiating tufts in a druse, with quartz crystals and stibnite from a vein in a quartz reef, United Brothers' Mine, Sunnyside* (W.).

Laumontite.*§—Hydrous silicate of aluminium and calcium.

Partly in small crystals, and otherwise coating a joint in mesozoic sandstone, San Remo (R.).

Lead.—

Rolled pieces from the gold drift, Park Company, Ballarat West (B.M.).

Earthy oxide of.—With wolfram, head of Boggy Creek; in cavities in quartz, Tambo Mine, Deptford (Cl.).

Leucopyrite (?)—Iron arsenide.

Bright tin-white patches in coarse granular quartz, and also in tarnished patches in an iron-stained fine granular quartz, Eldorado (W.).

Without analysis it is impossible to decide definitely whether the iron arsenides are leucopyrite or lollingite, as the variance in composition is the only distinguishing feature. They also closely resemble arsenopyrite, for which mineral they are probably often mistaken. It is more than likely that there is a gradation from lollingite to leucopyrite, and thence by the addition of sulphur into arsenopyrite. Whether, like the latter mineral, they are auriferous, does not appear.

Limonite.—Hydrous sesquioxide of iron.

Pseudomorphous crystals after stilbite (?) and vivianite, Wannon (W.).

Analysis of limonite from the Mallacoota Proprietary Mine (Cl.):

Ferric oxide	41·95
Alumina	3·25
Water (hyg.)	1·08
Water (combined)	6·85
Bismuth	trace
Insoluble residue	46·30

Gold, 7 ozs. per ton; Silver, 6 dwts. per ton.

Limonite occurs all over the colony, and may be found almost wherever decomposition has taken place, more especially in the areas of basic eruptive rocks and in most outcrops of mineral lodes. It is therefore useless to record occurrences unless they have some special mineralogical or economic interest.

LITHOMARGE.—(Indurated kaolinite).

Of shining porcelain-like appearance, coloured red in part by iron sesquioxide, Maryborough district (W.).

MAGNESITE.—Magnesium carbonate.

Earthy and impure nodules, 14 miles from Euroa (W.).

Vesicular, Will-Will-Rook; with calcite in dolerite, partly coated with hyalite, Ballarat (B.M.).

MAGNETITE.—Iron protoxide and iron sesquioxide.

Large, dull brown, polished grains, Myamyn; Angular and partly rounded fragments, Surrey Hills (W.).

In perfect octahedrons, mixed with other non-metallic sands, Mitchell River (Cl.).

Analysis of Mitchell River magnetite; sample obtained by picking up with a weak magnet (Cl.).

Ferric oxide - - -	79·44
Ferrous oxide - - -	20·25
Magnesia - - - -	trace

MANGANITE.—Hydrous sesquioxide of Manganese.

Laminar, Superb Coy's. Mine, Linton (B.M.).

MARCASITE.—Orthorhombic Iron disulphide.

Nodular with fossil wood, Nelson mine, Sebastopol, Ballarat (B. M.).

MIRABILITE.—Hydrous sodium sulphate.

Efflorescent, earthy, in parts epsomite, Lal Lal (B.M.).

MOLYBDENITE.—Molybdenum disulphide.

Plates in quartz, Gurrum, near Euroa; Lancefield (W.).

MOLYBDITE.—Molybdenum trioxide.

An incrustation on molybdenite from a quartz vein in granite, Gurrum, near Euroa (W.).

MONAZITE.—Phosphate of cerium, lanthanum, didymium and mostly containing also thorium.

Small brown resinous grains in a sand consisting of quartz, wolframite, magnetite, menaccanite, chrysolite(?), felspar and gold, South Gippsland (W.).

Phosphate of Cerium.—Probably monazite. Pinch Swamp Creek, E. Gippsland (Cl.).

Nhill, and in gem sands generally (R.).

This phosphate of cerium, which is common in parts of Gippsland, if not monazite is a closely allied mineral, but it has never been completely analysed, perhaps owing to the difficulty of isolating it.

MULLERITE.—

A very doubtful mineral species (R.).

NEPHELINE.—See note under apatite.

OBSIDIAN.—

This and other glassy forms of rocks should not be included in mineral catalogues.

OLIGOCLASE.—A soda-lime felspar.

Analyses of oligoclase from the basalt, Anakies (M.Dt.). (See Report Aust. Assoc. for Advancement of Science, vol. vii., p. 375).

	No. 1.	No. 2
Silica	62·98	62·22
Alumina Ferric oxide	21·88	22·42
Lime	2·78	3·34
Magnesia	trace	trace
Soda	5·00	6·14
Potash	1·90	2·30
Unestimated and loss	5·46	3·58

OPAL.—Silica with some water.

var. Semiopal.—Massive, Beechworth; with felspathic clay in basalt, Deep Creek (B.M.).

var. Hyalite.—Botryoidal crust in vesicular lava, McDonald's Hill, Smeaton (B.M.).

var. Infusorial earth.—Grey and argillaceous; contains plant remains. Sewerage tunnel near Railway Street, South Yarra* (F. Spry).

Analysis of infusorial earth from Cardigan (B.M.):

Silica	79·89
Alumina	9·95
Ferrous oxide	trace
Magnesia	trace
Lime	trace
Carbonic dioxide	trace
Water at 100°	5·41
Water after ignition	4·78

Orthoclase.—Potash felspar.

Massive lamellar, Anakies; pink twin prisms with quartz in granite, Ovens (B.M.). Massive, dull red, showing cleavage planes, and enclosing small irregular patches of talc, parish of Boweya, County Moira* (W.).

Analysis of large crystals from Mount Taylor (Cl.):

Silica	62·84
Ferric oxide	1·43
Alumina	20·23
Manganese oxide	trace
Lime	·92
Magnesia	·30
Potash	10·09
Soda	3·25
Loss on ignition	1·20

Since no microscopical examination was made it is possible there may have been another felspar included between the laminae.

Paragonite.§—A hydrous soda mica.

Greyish white pearly scales on quartzose rock with pyrite and arsenopyrite, Golden Mountain, Doon (B.M.).

Pharmacosiderite.—Hydrous iron arsenate.

This mineral was not found at Castlemaine (U.).

Phillipsite.—Hydrous silicate of aluminium, calcium and potassium.

Simple twin crystals in a druse in basalt, Flinders (R.).

Pinite.—An alteration product, composition not definite.

Pseudomorphous crystals after iolite, accompanied by quartz and felspar crystals from a cavity in granite, Bradford, near Maldon (J. Hornsby).

Greyish-white matted scales from a quartz reef, Eaglehawk (B.M.).

PLATINUM.—

Some examples examined were reported by Mr. W. Paterson, of the Bank of Victoria, to occur at Turton's Creek, Gippsland, with gold and osmiridium (R.).

PLESSITE.—See note under taenite.

PREHNITE.*—Hydrous silicate of aluminium and calcium.

In removing some calcite from a specimen of axinite from Dookie, by dilute hydrochloric acid, a few white crystals of prehnite were revealed. They are very thin and fragile, with broken outline and faces marked with cross striations. The mineral occurs in diorite, and is associated with axinite, garnet and calcite. A dull green acute angled crystal was likewise noticed, which can probably also be referred to this species. It was surrounded by a fine fibrous amphibole like byssolite (W).

PSILOMELANE.—Composition varied, but mostly manganese oxide.

Veins in silurian slate, McKenzie's Diggings, Goulburn; solid dendrites in a quartz boulder, Chinaman's Flat, Maryborough (B.M.).

Botryoidal forms incrusting quartz, Ararat* (W.).

PYRARGYRITE.§—Sulphantimonite of silver.

Democrat Mine, Glen Wills (Cl.).

PYRITE.—Iron disulphide.

Cubical crystals densely impregnating orthoclase, Ararat; small veins of secondary origin in metamorphic sandstone, Kensington Street Sewer, South Yarra; nodule of radiated structure from decomposed granite, William Street Sewer, South Yarra (W.).

Pyrite is so widely distributed that no record has been kept of its occurrence in quartz reefs. It may almost be said that where these are found, so also will pyrite be found in more or less quantity, and even in quartz which has every appearance of being quite pure, this mineral will reveal itself in many instances after

crushing and washing. The reefs which do not contain it are also probably devoid of the precious metal. Auriferous dyke rocks are invariably pyritic, and in the county rock adjacent to them and to many quartz reefs, the mineral is also developed. Secondary pyrite is mostly non-auriferous, and, as far as can be ascertained, never contains gold in payable quantity.

PYROLUSITE.—Manganese dioxide.

Buchan River (Cl.).

PYROPHYLLITE.—Hydrous silicate of aluminium.

Scaly, rich in lithia, Egerton (B.M.).

PYRRHOTITE.—An iron sulphide.

Massive, Thomson River; in diorite, Buldah Creek, East Gippsland (Cl.).

QUARTZ.*—Silica.

Massive, green and crystalline; the colour is perhaps due to the presence of chlorite. One mile south-east of Tangil (W.).

var. Chalcedony.—Grey in colour and of fine botryoidal structure on porous limonite, Granite Flat, Snowy Creek (W.). Banded, Mount Cudgewa, Upper Murray. From a cross course at a depth of 5 feet, Mount Blackwood (B.M.).

Agate.—Banded with crystalline growth, Yandoit (B.M.).

Basanite.—Rolled fragment, Ovens River (B.M.). In most drifts all over the colony (R.).

Flint.—Nodular concretion, Loutit Bay (B.M.).

Jasper.—Massive in Upper Silurian, Mount Cooper (B.M.).

RHABDITE.—A phosphide of iron and nickel.

This mineral occurs plentifully in the meteorites forming nearly one per cent. of the mass of the nickel-iron in the Cranbourne No. 1, Cranbourne No. 1 Meteorite (F.). Beaconsfield Meteorite (C.). Analysis :—

	Cranbourne No. 1.	Beaconsfield.
Iron	38·242	(diff.) [45·54]
Nickel	49·335	42·62
Cobalt	—	[0·80]
Phosphorus	12·950	15·05

Specific gravity—6·33 to 6·78.

The analysis of Cranbourne No. 1 is the mean of three analysis. The iron and cobalt analysis in the Beaconsfield failed, but cobalt was estimated at 0.80.

See also note under taenite.

Rubellan.—An alteration product.

Hexagonal reddish plates derived from the decomposition of olivine by hydration and oxidation of the iron. The specimen is in the form of a volcanic bomb, Mount Leura (W.).

Schreibersite.—Phosphide of Iron and Nickel.

Occurs as an irregular envelope round the troilite patches or nodules, and also as independent cystals through the nickel-iron. It is between tin and silver-white in colour, and its specific gravity is about 7·17. It can be obtained as a coarse insoluble powder by treating the crude nickel iron with hydrochloric acid till all action ceases. It is magnetic, and dissolves readily in nitric acid.

Beaconsfield meteorite (C.); Cranbourne No. 1 Meteorite (F.); Cranbourne No. 2 and Langwarrin Meteorites (W.).

Analysis:

	Cranbourne No. 1	Beaconsfield
Iron	56·245	66·92
Nickel	29·176	18·16
Cobalt	—	0·62
Phosphorus	13·505	14·88

In searching through the debris of the Cranbourne No 1, two other phosphides were discovered. One, a large brass-coloured oblique crystal, gave on analysis the following results:—

	No. 1.	No. 2.
Iron	69·251	69·843
Nickel[1]	—	—
Phosphorus	15·420	16·666

The other phosphide consisted of crystals apparently in the form of square prisms, which, while the sides were quite

1 Both determinations lost.

bright and metallic, had a square centre of a dull, almost black, colour.

Analyses:

Iron - - - -	67·480
Nickel - - - -	20·318
Phosphorus - - -	12·317

SCHRÖTTERITE.§*—Hydrous aluminium silicate.

Blue semi-transparent veins traversing a milky white amorphous aluminium silicate. The veins are very opal-like in their appearance, and the colour, which is rather bright in the centre becomes almost lost towards the sides. The specimen was obtained from the Government track between Bright and Wood's Point (W.).

SCORODITE.—Hydrous ferric arsenate.

An earthy crust on arsenopyrite in a quartz gangue, 14 miles from Euroa; minute green crystals in a ferriferous drusy quartz from a reef two feet wide, Benalla (W.).

SIDERITE.—Iron protocarbonate.

Massive, argillaceous and calcareous, coloured with carbonaceous matter, Morwell (W.).

var. Sphaerosiderite.—Small, almost perfect spheres of a dirty brownish yellow colour on basalt, Garlick's Lead, Trentham* (W.). Nearly wholly decomposed to hydrous oxide of iron, Ceres, near Learmonth (B.M.).

SILVER.—

A sulphide associated with pyrite in quartz, Gelantipy (Cl.).

SPHALERITE.—Zinc sulphide.

Vein at Mount Tara; crystals of metallic grey colour, Cassilis (Cl.).

Analysis of sphalerite from Cassilis (Cl.):

Zinc - - - - -	63·29
Iron - - - - -	4·61
Sulphur - - - -	29·88
Insoluble - - - -	·15

SPHENE.—Titanium and calcium silicate.

Tarago River, South Gippsland (Cl.).

SPINEL.—Alumina and magnesia.

var. Ruby Spinel.—Both determinations of this mineral are wrong, and, to my knowledge, it has never been identified in Victoria (U.).

var. Pleonaste.—This common black variety occurs in many of our alluvial deposits, and is frequently mistaken for cassiterite. It can easily be distinguished by its vitreous lustre, conchoidal fracture and superior hardness.

STIBNITE.—Antimony sulphide.

United Brothers' Mine and Democratic Mine, Glen Wills (Cl.).

Scrubby Creek, Mitta Mitta; Mulgrave; Eildon, Goulburn River; with antimony oxide, Burgoyne; with kermesite, Tallandoon; Toombullup; Little River, Wodonga; Steel's Creek; a vein two to three inches wide, the casing shows gold, one mile east of Dunolly (M.Dt.); with antimony oxide, 14 miles from Euroa (W.).

STILBITE.—Hydrous silicate of aluminium, calcium and sodium.

Small sheaf-like groups of clear crystals from druses in the older basalt, Westernport (W.). Small crystals associated with calcite from a joint in mesozoic sandstone, San Remo (R.).

TAENITE.—A meteoric nickel-iron.

On decomposition and disintegration taenite lamellae may be separated in quantity from the resulting fine material. The highest specific gravity obtained was 7·1754 which is low for an alloy so rich in nickel. Analysis:

	No. 1.	No. 2.
Residue	3·07	—
Iron (diff.)	49·38	50·92
Nickel	46·39	47·98
Cobalt	0·61	0·63
Carbon	0·45	0·47
Phosphorus	0·10	—

No. 2, after deducting the phosphor-iron-nickel (3·73%). Beaconsfield meteorite (C.). In addition to taenite other nickel-iron alloys are common to metallic meteorites such as plessite and kamacite. Although only one

occurrence may be given, as in this instance, it must be understood that, owing to the fact that the various metallic meteorites found in the colony, viz.—The Cranbourne Nos. 1 and 2, the Langwarrin and the Beaconsfield, are undoubtedly fragments of a parent body, their mineral constituents will be identical but perhaps not equally distributed. The want of an exhaustive examination is probably responsible for the apparent absence of them in some of the meteorites (W.).

TALC.—Hydrous magnesium silicate.

Consists of small scales stained with ferric oxide, occurs as a vein six inches wide, Hedi (W.). The record of talc from Heathcote is incorrect, the mineral proved to be talcosite (U.).

TENNANTITE.§—Sulpharsenite of copper.

The specimen closely resembled tetrahedrite but gave strong reactions for arsenic instead of antimony; it is associated with chalcopyrite in a quartz gangue, Empress Lode, Merry Creek (W.).

An assay of a bulk sample gave as follows (M.Dt.):

Copper, 15·8 per cent.
Gold, 13 dwts. 1 grain per ton.
Silver, 9 ounces 9 dwts. 11 grains per ton.

TETRADYMITE.§—Bismuth telluride.

Plates with splendent metallic lustre in places showing a light bronze tarnish cleaves easily into laminae, strongly resembles molybdenite; occurs associated with gold in quartz, Maldon Gold Field Coy. The composition of this mineral had been ascertained by Mr. Hiscock from whom the specimen was received (W.).

TOURMALINE.—A complex silicate containing boron.

Concentric radiating groups in quartz, Lindenow; in binary granite near Nar-nar-goon (W.). In greisen, Cassilis (Cl.).

TROILITE.—Monosulphide of Iron.

Occurs almost entirely as more or less rounded masses, varying in size from half-an-inch to more than two inches in length. They are usually surrounded by schreibersite and graphite, and sometimes by daubrée-

lite. These minerals do not penetrate or mix with it, as in the case of some meteorites. Cranbourne No. 1 Meteorite (F.), Beaconsfield Meteorite (C.), Cranbourne No. 2 and Langwarrin Meteorites (W.).

Analysis :

	Cranbourne No. 1				Beaconsfield	
	1.	2.	3.	4.	1.	2.
Iron	—	62·150	63·613	—	57·49	58·08
Nickel	—	0·446	—	—	4·30	4·34
Cobalt	—	—	—	—	1·50	1·52
Sulphur	36·543	—	36·207	36·250	35·71	36·07
Copper	—	0·079	—	—	—	—
Chlorine	—	0·130	—	—	trace	—
Graphite	—	—	—	—	0·33	—
Insol. residue	0·215	2·297	—	—	—	—

TURQUOIS.—Hydrous phosphate of aluminium with some copper.
Thin veins and incrustations of greenish-blue colour with quartz and slate, Lurg, near Benalla (M.Dt.).

WOLFRAMITE.—Iron and manganese tungstate.
Crystals in quartz from the granite of Mount Buffalo; sand in an auriferous wash, foot of Mount Buffalo and Hoddle's Creek; in quartz, Cameron's Creek; tabular plates in quartz, Jenolan River, Mallacoota (W.).
Head of Boggy Creek, Bullumwaal; in wash, Ensay; as a lode intermixed with quartz, Buckwong Creek, Limestone Creek (Cl.).
Analysis of Wolframite from Buckwong Creek (Cl.):

Tungstic trioxide	75·20
Manganese oxide	5·74
Ferrous oxide	17·63
Insoluble residue (mainly silica)	1·24

ANNUAL REPORT OF THE COUNCIL

FOR THE YEAR 1899.

The Council of the Royal Society herewith presents to the Members of the Society the Annual Report and Balance Sheet for the Year 1899.

The following Meetings were held, and Papers read during the Session :—

March 9.—1. "Further Descriptions of the Tertiary Polyzoa of Victoria, Part II.," by C. M. Maplestone. 2. "Sea Temperatures as an aid to Weather Forecasting," by T. W. Fowler, M.C.E. 3. "The Spectra of Oxygen, Sulphur and Selenium and their Atomic Weights," by L. Rummel.

April 13.—1. "A New Rotifer, Lacinularia striolata, with a note on L. pedunculata," by J. Shephard. 2. "The Tertiary Deposits of the Aire and Cape Otway," by T. S. Hall, M.A., and G. B. Pritchard.

May 11.—1. "Notes on Malurus gouldi and M. cyaneus, with special reference to their change in Plumage," by R. Hall. 2. "Note on an Abnormality in the Circulatory System of Hyla aurea," by Professor Baldwin Spencer.

June 8.—1. "On the Occurrence of Trachyte in Victoria," by E. G. Hogg. 2. "On some New Species of Victorian Mollusca," by G. B. Pritchard and J. H. Gatliff. 3. "On the Occurrence of Diprotodon australis, Owen, near Melbourne," by G. B. Pritchard. 4. "On some Remains of Marsupials from Lake Colongulac, Victoria," by C. W. De Vis, M.A., with Introductory Remarks on the Locality, by T. S. Hall, M.A. 5. "The Bone Clay and Associated Basalts at the Great Buninyong Estate Mine," by T. S. Hart, M.A. 6. "Remarks on a Fossil Implement, and Bones of an Extinct Kangaroo," by C. W. De Vis, M.A.

July 7—1. "On the Age of the Auriferous Quartz Reefs and Alluvial Deposits in Victoria," by W. H. Ferguson. 2. "Note on a Basalt Tree Cast," by R. H. Walcott, F.G.S. 3. "Exhibi-

tion of and Remarks on some New Central Australian Articles of Magic," by Professor Baldwin Spencer.

September 14.—"Phreatoicoides, a New Genus of Fresh-water Isopoda," by O. A. Sayce. The following exhibits were shown: 1. Model of an Ornithorhynchus Jaw enlarged, showing Dentition, by Professor Baldwin Spencer. 2. A series of Old Photographs of Victorian Fossils, taken by the late Richard Daintree, probably about 1866, by T. S. Hall.

October 12.—1. "Solar Heat," by Isaac Tipping, C.E. 2. "Catalogue of the Marine Shells of Victoria, Part III.," by G. B. Pritchard and J. H. Gatliff. 3. "Description of a New Lizard from Northern Queenlsand," by A. H. S. Lucas, M.A., B.Sc., and C. Frost, F.L.S.

November 16.—1. "Niphargus pulchellus, a New Victorian Blind Amphipod," by O. A. Sayce. 2. "A New Genus and a New Species of Fish from the Mesozoic Rocks of Victoria," by T. S. Hall, M.A.

December 14.—1. "Further Descriptions of the Tertiary Polyzoa of Victoria, Part III.," by C. M. Maplestone. 2. "Note on Two Fossil Plants from Dundas," by W. S. Dun. 3. "On Some New Genera and Species of Australian Coleoptera," by Rev. T. Blackburn, B.A.

During the course of the year the Society has lost four associates and gained seven members and two associates.

The Council regrets to record the death of Professor Sir F. M'Coy, a former President of the Society and one of its earliest members.

During the year the following publications have been issued: "Proceedings" (New Series), Vol. XI., Part II., and Vol. XII., Part I. The second part of Vol. XII., is nearly ready for publication.

The Council has still to regret that the usefulness of the Society is crippled by want of funds.

The Librarian reports that during the year about 1200 volumes and parts of volumes were added to the Library, which is growing so rapidly that the question of additional shelving will soon have to be faced. There seems to be no possibility in the present state of the Society's finances of binding keeping pace with the increase of the number of volumes.

The Honorary Treasurer in Account with the Royal Society of Victoria.

Dr.			Cr.	
To Balance from 28th February, 1899 ...		£113 4 3	By Printing and Stationery	£127 16 8
Government Grant—			Rates	7 0 0
On account of Vote, 1898-99 ...		£50 0 0	Gas and Fuel	6 10 0
Subscriptions—			Salary of Assistant-Secretary	25 0 0
Members ...	£46 4 0		Custodian	5 10 0
Country Members	5 5 0		Insurance	4 10 0
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Arrears	26 5 0		Repairs	3 0 0
		98 14 0	Books and Periodicals	3 11 8
Rent of Rooms		11 0 0	Freight	4 6 6
Sale of "Proceedings"		1 15 2	Refreshments	4 2 0
Interest		5 0 0	Binding	4 9 9
			Incidentals, Advertising, etc.	3 19 9
			Balance (28th February, 1900) ...	67 7 3
		£279 13 5		£279 13 5

PUBLISHING AND RESEARCH FUND.

Dr.		Cr.	
To Fixed Deposit in Bank	£200 0 0	By Interest transferred to General Account	£5 0 0
Interest on same	5 0 0	Balance on Fixed Deposit in Bank of Australasia	200 0 0
	£205 0 0		£205 0 0

Compared with the Vouchers, Bank Pass-Book and Cash-Book, and found correct,

C. R. BLACKETT,
Hon. Treasurer.

H. MOORS,
T. E. EDWARDS, } *Auditors.*

5th March, 1900.

The Royal Society of Victoria.

1900.

LIST OF MEMBERS,

WITH THEIR YEAR OF JOINING.

Patron.

His Excellency Sir John Madden, K.C.M.G.	1895

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Agnew, The Hon. Sir J. W., K.C.M.G., M.E.C., M.D., Hobart, Tasmania	1888
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Dendy, Professor Arthur, D.Sc., F.L.S., Canterbury College, Christchurch, N.Z. 1888

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Howes, Professor G. B., LL.D., F.R.S., Royal College of Science, S. Kensington, England 1898

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Stirton, James, M.D., F.L.S., 15 Newton-street, Glasgow 1880

Associates.

Adney, T. W., Arnold-street, South Yarra 1899
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Ferguson, W. H., 23 Service Crescent, Albert Park 1894
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Fison, Rev. Lorimer, M.A., Essendon, Victoria ... 1889
Fulton, S. W., 367 Collins-street, Melbourne 1900

Gabriel, J., Victoria-street, Abbotsford, Victoria ... 1887
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Grant, F. E., Union Bank, Collins-street 1898
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Hall, Robt., Elgar-road, Box Hill 1900
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Holmes, W. A., Telegraph Engineer's Office, Railway Department, Melbourne 1879

Ingamells, F. N., Observatory, Melbourne ... 1889

Kernot, Frederick A., 66 Russell-street, Melbourne ... 1881
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Murray, Stuart, C.E., Department of Water Supply, Melbourne 1874

Phillips, A. E., Box 396, G.P.O., Melbourne ... 1883
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Schäfer, R., Union-street, Windsor, Victoria 1883

Shaw, Alfred C., Bond-street, Abbotsford, Victoria	...	1896
Stewart, C., Oxford Chambers, Bourke-street, Melb.	...	1883
Thiele, E. O., 219 Osborne-street, Williamstown	...	1898
Tisdall, H. T., 7 Washington-street, Toorak ...	...	1883
Wedeles, James, 231 Flinders-lane, Melbourne	...	1896

INDEX.

(*The names of new genera and species are Printed in Italics*).

END OF VOL. XIII.

[ISSUED MARCH, 1901.]

Printed by FORD & SON, Drummond Street, Carlton, Melbourne.

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Publications of the Royal Society of Victoria, and of the Societies amalgamated with it.

VICTORIAN INSTITUTE FOR THE ADVANCEMENT OF SCIENCE.

Transactions. Vol. 1. 1855.

PHILOSOPHICAL SOCIETY OF VICTORIA.

Transactions. Vol. 1. 1855.

These two Societies then amalgamated and became:—

PHILOSOPHICAL INSTITUTE OF VICTORIA.

Transactions. Vols. 1–4.

The Society then became:—

ROYAL SOCIETY OF VICTORIA.

Transactions and Proceedings (Vol. 5, *entitled* Transactions). Vol. 5–24.

Transactions. Vol. 1, 2, 3 (part one only), 4. 1888–95.

Proceedings (New Series). Vol. 1——. 1888——.

MICROSCOPICAL SOCIETY OF VICTORIA.

Journal (Vol. 1, Pt. 1, *entitled* Quarterly Journal). Vol. 1 (Pts. 1 to 4), 2 (Pt. 1), title page and index [*all published*]. 1879–82.

[*The Society then combined with the* ROYAL SOCIETY OF VICTORIA.]

NOTE.—*Most of the volumes published before 1890 are out of print.*

PROCEEDINGS

OF THE

Royal Society of Victoria.

VOL. XIV. (NEW SERIES).

PART I.

Edited under the Authority of the Council.

ISSUED AUGUST, 1901.

(Containing Papers read before the Society during the months of May and June, 1901).

THE AUTHORS OF THE SEVERAL PAPERS ARE SEVERALLY RESPONSIBLE FOR THE SOUNDNESS OF THE OPINIONS GIVEN AND FOR THE ACCURACY OF THE STATEMENTS MADE THEREIN.

MELBOURNE:
FORD & SON, PRINTERS, DRUMMOND STREET, CARLTON.

AGENTS TO THE SOCIETY:
WILLIAMS & NORGATE, 14 HENRIETTA STREET, COVENT GARDEN, LONDON.
To whom all communications for transmission to the Royal Society of Victoria, from all parts of Europe, should be sent.

1901.

A

CONTENTS OF VOLUME XIV.—Pt. I.

ART. I.—*A Revision of the genus Gymnorhina.*

BY ROBERT HALL.

[Read 16th May, 1901.]

The warrant for the acceptance of the species of this genus appears to be as follows:—The white-backed species is different from the black-backed species in the region of the back. The Lesser white-backed species is said to be smaller than the white-backed. The long-billed species is said to have a longer and slenderer bill than any other of this genus. Thus, briefly, we have the leading characters of the four species of this Australian genus.

Just as G. tibicen, Lath., of the interior of New South Wales, is found to be smaller than the representatives of the same species along the coast of that colony, so does G. hyperleuca, Gld., of Tasmania, compare with G. leuconota, Gld., which is defined by Dr. Gadow[1] as a smaller race of the mainland species. G. tibicen I make a variety of G. leuconota, as intermediate links exhibited will show, or to place it in the way suggested above, G. leuconota is the larger and more developed race of G. tibicen. This latter species appears to me to be the intermediate phase between an extinct piping-crow, and the present whole-white-backed piping-crow or magpie.

In dimensions, certain specimens of G. leuconota show the bill and body to have the same measurements as those of G. hyperleuca on the one side, and of G. dorsalis, Campbell, on the other. Although the slender bill of G. dorsalis, and the shorter one of G. hyperleuca may stand as leading characters in a large number of specimens, they fail to do so in a small number. There are numerous specimens of G. tibicen and G. leuconota that will not answer to any key to the species of Gymnorhina yet given. Each appears to show reversion or hybridism upon the back for the one part and want of agreement with recognised measurements on the other, and this is especially so in the case of the

1 Brit. Mus. Cat. Bds., vol. viii., p. 93 (1883).

bill. In reality, as I see it, the specimens of G. tibicen show an advance in plumage development by losing nearly all of the black saddle in favour of a "white-back," while certain of those of G. leuconota have undergone reversion, in part, to the present day "black-back." Specimens by measurement connect the two. It is particularly interesting to see in specimens of the fledglings of G. dorsalis, the nearest approach to what appears to me as the original uniform black type.

The principal plumage-phases of all the Gymnorhinae appear in G. dorsalis.

(1). We have the fledgling shewing two phases—one, apparently a relic of an early ancestor of the various existing magpies, with the back almost black, or more or less slightly pied, from the nape to the upper tail coverts, both of these narrow regions being pure white; and the second with a very small amount of black upon a nearly pure white back.

(2). The saddle-back of G. tibicen, slightly greyer in colour, is shewn in an immature male bird found to be breeding.

(3). A pure white-back in the adult of each sex.

At Bacchus Marsh, Victoria, the hybrid-like birds of G. leuconota are plentiful, as Messrs. C. C. and T. A. Brittlebank have observed; while at Western Port, Victoria, they are less so. At Horsham, Victoria, the hybrid-like phase of G. tibicen is plentiful, while whole white-backs are found breeding in the same district and have been shot from the same flocks. Just as a black-backed phase of G. dorsalis has been observed in Western Australia, by the writer, to be mated with a whole white-back, so has the same been noted with G. tibicen and G. leuconota (judging by the backs alone) in the Wimmera. One female bird procured at Essendon, Victoria, referred to later, I can only place as a probable specimen of G. leuconota. In Central Australia specimens were collected by Mr. Keartland on the Horn Expedition, and marked by Mr. North as belonging to G. tibicen. The "saddles" are feebly represented (narrow and disjointed) and belong to birds shewing reversion if G leuconota, "development" if G. tibicen, or hybridisation.

It is generally thought that G. tibicen and G. leuconota occupy different sides of the Great Dividing Range of Victoria. To an extent only that is so. Each of their young has been found

upon the other's so-called ground. While it may be proved some day that certain birds are hybrids to the north of the Divide in Victoria, it will not be easy to prove that the so-called hybrids in such a district as Western Port are hybrids. Special attention has been given to the magpies of this latter district by Mr. G. E. Shepherd, with the result that he has never seen other than G. leuconota. Of birds shot at Somerville, examples shew partial reversion to G. tibicen rather than hybridisation. That G. leuconota is always larger than G. tibicen is not so. Specimens shew the same dimensions.

Examples of G. dorsalis handed to me by Mr. A. J. Campbell have slenderer bills, but others collected by the writer near the same locality (Kojonup, W.A.) have bills as deep as those of G. leuconota, while one bill of G. leuconota is as slender and long as in G. dorsalis. Mr. Campbell now believes that the bird described[1] by himself as a typical adult female of G. dorsalis was a peculiar immature female, certainly it is not a typical adult female. Possibly it would not have developed beyond the second stage (saddle-back), in which case we would have a permanent black-back mated with a white-back in Western Australia.

Although Mr. Gould believed there was sufficient difference between the western bird and G. tibicen to form a new species, an examination of specimens by Dr. Ramsay led him to retain the bird in his Tabular List (1888) as G. leuconota.

The bulk of the black-backed birds appear to occupy the central part of the continent, while the white-backed occupy coastal positions on the eastern and western wings. Reversion, but mostly plumage development from a black to white back, I take it, works in all.

The various phases of G. dorsalis strongly support G. leuconota as being at the moment our standard magpie, and in placing G. tibicen as a phase of it, it is to be remarked the broad band on the back for one or more generations in some nesting-families remains persistent. The tendency of the fledgling is just as strong to shew a whole white back as it is in other cases to go through the second stage of showing a black band on the back,

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1 Proc. Roy. Soc. Vict. 1895, p. 206.

or to persist in agreeing with what appears to be the old type in being nearly uniformly black upon the dorsal surface.

The following are measurements of the principal parts of specimens of each so-called species :—

G. LEUCONOTA, Gld.

	Culmen.	Wing.	Tail.	Tarsus.
	inches.	inches.	inches.	inches.
a^1 Ad. ♂ and ♀. British Museum specimens - - - - -	2	10·2	6	2·3
b^1 Labelled ad. ♂. Morwell, Victoria	2·1	11·25	6·75	2·4
c^1 Adult ♂. Somerville, Victoria, 10/6/98 - - - - - -	2·1	11	6·75	2·4
d^1 Adult ♀. Box Hill, Victoria, 1/12/99 - - - - - -	1·9	11	6·25	2·3
e^1 Adult ♀. Box Hill, Victoria, 7/9/00 - - - - - -	1·7	10	6	2·1

Specimens in the National Museum, Melbourne, shew the length of culmen to be in :—

(*a*) ♂ - - - 1·9 inches.
(*b*) ♂ - - - 1·9 inches.
(*c*) ♀ - - - 2·25 inches.
(*d*) ♂ - - - 2·2 inches.

While (*a*) is a male with a culmen less than 2 inches, (*c*) is a female with a culmen considerably more than 2 inches.

Specimen b^1 is an example of a phase having an appearance about the back that neither definitely indicates an adult female nor a hybrid. The soft brown mark appearing as if beneath the surface of the back are not those of a female bird, yet the adult male should have a clear white back as this nearly is. The marks are ancestral in appearance. The Brit. Mus. Cat. Birds, vol. viii., p. 93, refers to a similar specimen as "a bird in fully adult plumage with the middle of its back still mottled with pale silvery grey."

Specimen c^1 is a large male shewing a narrow "saddle" on the back (1 inch in diameter), and on the head, tail and sides of it a number of light brownish marks. In a district where there do not appear to be any living specimens of G. tibicen, these marks are most likely ancestral.

Of many specimens seen by Mr. G. E. Shepherd to shew variation in the district named, one was recorded in the Victorian Naturalist, Vol. XII., p. 68, as a probable new species or a hybrid. Mr. A. J. North[1] commented upon it and said, because of the great variation in the width of this band, which in some specimens is reduced to a narrow line of black feathers, the possibility of it being a species is precluded, but it may be due to atavism. This latter, however, is not Mr. North's view of the matter, "as no Tasmanian specimen is yet to hand shewing a marked deviation."

G. TIBICEN.

	Culmen.	Wing.	Tail.	Tarsus.
	inches.	inches.	inches.	inches.
A. Adult ♂. Murtoa, Victoria, 1898	2	10·25	6	2·2
B. Adult ♂. Murtoa, Victoria, 1898	2	10	6	2·2
C. Adult ♂. Murtoa, Victoria, 1898	2	10·5	6·25	2·2
D. Adult ♂. Murtoa, Victoria, 1898	2	10	6	2·15
E. Adult ♂. Victoria - - -	2·2	10	6	2·15
F. Adult ♂ and ♀. British Museum specimens - - -	2·1	10·6	6·5	2·3
G. Adult ♂ and ♀. British Museum specimens - - -	2·2	10·8	6·8	2·4
H. Adult ♂. Victoria, 1893 - -	1·8	10	6·25	2·1

Two specimens in the National Museum, Melbourne, have their culmens 1·85 inches in length, while others, described in the Zoologist, June 1900, by Mr. E. Degen, range between 1·8 and 2·25 inches.

The most important point of interest in the above specimens is in the series of different sized "saddles," ranging from the more ordinary one (3·65 inches in diameter) to the less ordinary one, 0·9 inch. Other recorded specimens have their saddles represented by scattered feathers that are not solid enough to form even a narrow solid "saddle." Some of the "saddle" feathers of specimen D are edged with white, which is not uncommon in places at least 1000 miles apart, and which are on the out parts of two of four boundaries (Southern Victoria and Central Australia).

[1] Report of the Horn Exp. Cent. Aust., Zool., p. 70 (1896).

Essendon, Victoria, is thought to be stocked with G. leuconota alone, yet the specimen marked J is a nearly mature female of a bird that could only be doubtfully marked G. tibicen, and preferably G. leuconota. It has a narrow "saddle" with a diameter of 0·9 inch, and carries the leading characters of two species, *i.e.*, the female back of G. leuconota and the female saddle of G. tibicen. There is nothing whatever to say it is not G. leuconota in the reversional stage. The dimensions are: culmen, 1·8 in.; wing, 10in.; tail, 6in.; tarsus, 2·25in.

Mr. A. McGregor, to whom I am indebted for the Murtoa skins, has shot the pure "white-backs" among the flocks of "black-backs." This tends partly to the theory of hybridism, but it does not support it by the results noted at Essendon, Morwell and Somerville, where an isolation of species appears to exist.

G. HYPERLEUCA, Gld.

	Culmen.	Wing.	Tail.	Tarsus.
	inches.	inches.	inches.	inches.
a^{11} Adult ♂ and ♀. British Museum - - - - - -	1·7	9·3	5·8	2·1
b^{11} Sk. ♀. National Museum - -	1·8	10	6·5	2

Specimens in the Australian Museum led Dr. Ramsay to consider this bird not a good species (Tab. Hist. Aust. Birds, 1888).

G. DORSALIS, Campbell.

	Culmen.	Wing.	Tail.	Tarsus.
	inches.	inches.	inches.	inches.
a^{111} Adult ♂. Kojonup, W.A. -	2	10	6	2·1
b^{111} Adult ♂. Kabanning, W.A., 6/10/99 - - - - - -	2	10	6	2·1

Mr. Campbell[1] gives the measurement of the longest culmen as 2·31 inches.

The bird referred to by Gould in his Tabular List (Folio, Bds. Austr.) as a doubtful specimen of G. tibicen doubtless is an

1 Proc. Roy. Soc. Vict., N.S., vol. vii., 1895.

immature specimen of G. dorsalis, agreeing with one of my skins. It is a bird that, on first sight and without a knowledge of such a phase, might easily be mistaken for G. tibicen.

In the matter of comparison of the young with the adults, Gould says in his folio work that "the young of G. tibicen assume the plumage of the adult from the nest, and no change takes place from age or season."

The Brit. Mus. Cat. Bds., vol. viii., p. 92, remarks that (*a*) is a specimen of G. tibicen, with a back blackish, narrowly-tipped with grey; that (*b*) is a specimen of G. tibicen, with its neck patch not so well defined; the feathers of the hinder part of the neck being mottled with black; the feathers of the back, white-edged; rump feathers with white tips only, producing a mottled appearance. One of these juvenile skins is labelled Queensland, the other Australia. In one of my fledgling skins of G. leuconota there is a tendency to shew very little white, and that where it usually appears, on the neck and rump. The above facts alone are enough to shew that the fledglings and young of the eastern species are inconstant, like those of the western form, though to a more limited extent, judging by the small amount of material we have noted.

G. dorsalis shews its fledglings to be either almost wholly white-backed or black-backed, with phases varying between the extremes, while the immature birds, in certain cases, have distinct, though narrow, blackish "saddles." I should venture to say this phase is the bird referred to by Gould and Ramsay as G. tibicen, and altered (Tab. Lists) later by Dr. Ramsay to G. leuconota. It seems to me that the black-backed variety of Western Australia has not been able to hold its own, failing to become a species, and now merging, if not already so, into G. leuconota. In Central Australia the "black-back" exists, but with varieties and "white-backs," through the interior and on three sides of it. Whether the black-backed variety, at present strongly posted in the south-east of the continent, will fail to survive and become a species seems to me uncertain. On the extreme south-east of Australia and Tasmania the "white-backed" variety, as in Western Australia, has proved itself to be the fittest. Between Southern Victoria and Central Australia the law of natural selection is strongly working to make the

black-backed variety a species by keeping the amount of black in a large number of specimens a constant quantity.

At the present time it is very variable, almost giving way to a uniform white back, while the known white-backs in the same breeding paddocks appear to revert to and shew the same quantity of black saddle as in these small saddle-backs of the recognised black-backed species. From Minyip, Victoria, Mr. J. P. Eckert has forwarded the following note to me: "To your question whether the black-backed and white-backed magpies mate together, I reply, emphatically, yes. In fact, the greatest percentage of magpies in this district consist of what I consider cross-breds. An instance of this kind has been under my notice for several years. As mentioned above, a pair of black-backed magpies have been in the habit of rearing their young on trees near my house for upwards of ten years. A few seasons back a white-backed cock appeared on the scene rather late in the year and drove away the black-backed male. The nest had already been made and the hen bird commenced laying shortly afterwards and hatched a brood of three. When the young were about a week old, I found them one morning on the ground and dead. At first I thought that the banished mate might have taken revenge and destroyed the brood, but on second thought, knowing quite well how jealously all magpies guard their nest, I was positive that such a thing was almost impossible. Having found elsewhere young magpies thrown out the nest, and, as Mr. J. A. Hill, my friend, had made the same observation, I put it down to the scarcity of food on account of the drought in that season. The old birds might have killed their young to preserve their own life. The following season *that same pair*, the black-backed female and the white-backed male hatched two young, one a *cross-bred* and one a *perfect white-back*. The white-back was thrown out of the nest and killed. Last year this same pair again built a nest quite close to the house and hatched a brood of four, three *black-backs* and one *white-back*. By some accident the white-backed male was killed, and the black-backed returned immediately to his former spouse, but next morning I found the white-backed young bird, which was all but fledged, thrown out. I replaced it again, but it was no time before it was out again. Seeming to be all right, I placed it underneath the tree where

the nest was, but the old birds took no notice of it. What puzzles me in this case is breeding true to colour in such cross-mating? Had the colours been mixed, explanation would not be difficult. What are we to call the offspring in such a case, pure-breds or cross-breds?"

If the case of the black and grey crows of the Old World is one of dimorphism, this is one of polymorphism, because of the bills and backs and dimensions other than those of sexual characters.

The position of the genus, as I see it, is represented by one species only, G. leuconota, Gld., with one variety, namely, that having a black back, at present known as G. tibicen, Lath. Where the variety begins and ends with the series of specimens exhibited, one cannot well say.

Art. II.—*Further Notes on the Igneous Rocks of South Western Victoria.*

By J. DENNANT, F.G.S., F.C.S.

[Read 13th June, 1901.]

(With Plate I.).

In the present paper I propose to supply a few additional details concerning some of the volcanic rocks described in a general manner a few years ago.[1]

Before doing so I wish to clear away a misapprehension which has arisen owing to the scheme of shading adopted in the map accompanying my former article. Both the olivine basalts and the typical sanidine-bearing series of rocks are there similarly shaded, not because I regarded them as identical, but simply because my researches were too imcomplete to enable me to define with even approximate accuracy their respective boundaries. As a fact, these two classes of rocks are so intimately associated in certain portions of the area that their separation can only be attempted on maps drawn to a large scale.

Since I drew attention to these rocks in 1893, the geology of the district has been reported upon by Mr. Ferguson, of the Geological Survey, who discovered a glacial deposit in the neighbourhood of Coleraine. Still later, Mr. E. G. Hogg has given a fuller account of the same deposit, and has besides examined the sanidine-bearing rocks with the result that he classes them as trachytes.

The first rock referred to by him occurs at Mounts Adam and Eve, and is described as light colored and porphyritic. It is of course a highly altered rock, and I gather from Mr. Hogg's subsequent remarks that his real type of the trachyte is the green, fresh-looking rock close at hand. Unaltered examples of such rocks are as a rule found only in the deeper quarries, since they weather readily and to a considerable depth from the

1 Aust. Assoc. Adv. Sci., Adelaide, 1893.

surface. An extreme example of a decomposed trachytic rock is afforded by a hill locally called "The Giant Rock" which is, as I stated previously, now little more than a mass of kaolin, with occasional light colored, but still hard bands in the deeper seated portions. Near this, and undoubtedly an outlier of it, a huge stone, many tons in weight, outcrops, and is known to residents as "The Little Rock." The latter is hard, rough, brown in color, and similar both in macroscopic and microscopic characters to the rock from the Mount Eve quarry. The outlines of the larger crystals of sanidine are still preserved, but they are no longer clear and pellucid, as in less altered rocks. An analysis which I made of a sample from "The Little Rock," gave the following result:—

SiO_2 - - - - -	68·22	per cent.
Al_2O_3 - - - - -	16.89	,,
Fe_2O_3 } FeO - - - - -	2·75	,,
CaO } MgO - - - - -	traces	
K_2O - - - - -	4·47	,,
Na_2O - - - - -	5·30	,,
Loss on ignition - -	·95	,,
Total -	98·58	,,

These two rocks are situated a few miles to the north of Mounts Adam and Eve on the Brit Brit Road. From a quarry not far distant I gathered the fissile, green, fresh-looking rock alluded to in my former paper as emitting a ringing sound when struck with the hammer. No chemical analysis has been made of it, but under the microscope it shews numerous lath-shaped sanidine crystals, with some tabular ones.

An excellent illustration of the changes effected in these trachytoid rocks by weathering was afforded some years ago, when an unusually deep as well as extensive quarry was opened near the Coleraine flour mill. Deep down, the rocks are greenish-black and much like a fine grained basalt in appearance, but above the weather line they become almost suddenly light grey or brown, and then might easily be mistaken for a metamorphic

sandstone. The microscopic structure of the unweathered rock at the base of the quarry has been previously given. Although this is undoubtedly a tolerably well preserved rock, I do not consider it typical of the trachytoid masses which cover so large an area to the north and west of Coleraine. The majority of my slides have been prepared from the rocks at Carapook, which is midway between Coleraine and Casterton. A quarry was opened here about 14 years ago to get stone for building a bridge over the creek, and the glistening crystals shewing on the clean cut surfaces of the blocks as they lay in a pile ready for use arrested my attention. This rock I traced to the quarry mentioned, which is situated on a rise about 1½ miles north of Carapook, and in a line with the Den Hills outcrop a few miles to the east. In hand specimens it is dark green, fissile, almost smooth to the touch, and speckled by the light colored sanidine pervading it. Macroscopic crystals of sanidine are not only abundant in the rock, but they are usually so perfect that when extracted whole, which can frequently be done, the two cleavages parallel to P and M become plainly visible. Owing to the number and size of the macroscopic crystals in the rock, I was able to separate a sufficient weight of them from the matrix for a complete chemical analysis, which gave the following result:—

SANIDINE CRYSTALS, CARAPOOK.

SiO_2 - - - - -	63·87	per cent.
Al_2O_3 - - - - -	22·32	,,
FeO - - - - -	2·40	,,
CaO - - - - -	·28	,,
MgO - - - - -	·01	,,
K_2O - - - - -	4·49	,,
Na_2O - - - - -	6·16	,,
Loss on ignition - -	·57	,,
Total -	100·60	,,

With this may be compared the following analysis of the rock in mass.

CARAPOOK ROCK.

SiO_2	63·37	per cent.
Al_2O_3	16·47	„
Fe_2O_3	4·45	„
FeO	1·21	„
CaO	1·27	„
MgO	·51	„
K_2O	5·57	„
Na_2O	5·88	„
H_2O (direct weighing)	·76	„
Total	99·49	„

Sp. gr. 2·67.

Only 6·2 per cent. of the finely powdered rock is soluble in cold and 8·36 per cent. in hot hydrochloric acid.

The excess of soda over the potash in the sanidine crystals is noteworthy. As a similar result is obtained in the analysis of the rock in mass, it may be concluded that the large proportion of soda present in the latter is derived, mainly at least, from the sanidine, and not from any nepheline overlooked in the microscopic slides.

Nearly all the larger crystals embedded in the rock are thin-tabular, and usually shew only the face $\infty P \grave{\infty}$ (010), though I have also noticed faces in the zone oP (001)—$\infty P \acute{\infty}$ (100). They vary in size, but seldom exceed 4 or 5 mm. in length. The predominating clinopinacoidal faces are traversed by a number of irregular cracks which are sometimes curved, but generally roughly parallel to the orthopinacoid. These cracks are often filled with fine dusty matter of a brownish hue. Owing to the two easy cleavages respectively parallel to the base and clinopinacoid, as well as to the cracks just mentioned, very fine laminae sometimes separate when a slice of the rock with a crystal at the extreme edge is mounted: between crossed nicols such laminae extinguish nearly parallel to the most perfect cleavage. One of my Carapook slides shews a large porphyritic crystal twinned on the Carlsbad type, which, under polarized light, is very similar in appearance to the sanidine twin

in the phonolite from Wolf's Rock, Land's End, England, figured by Rosenbusch in Fig. 2, Plate XXIII. of his "Microscopic Physiography." Several of the cracks parallel to T, characteristic of sanidine, are conspicuous in each half of the twin and meet on the twinning line at an angle of about 150°. The cleavages parallel to P are only faintly visible, the section not being thin enough to shew them well. The separate halves of the twin extinguish at an angle of 8° with the twinning line and on the opposite side of it, the angle between the two extinctions being thus 16°. The smaller crystals of sanidine, which constitute in reality the mass of the rock, are usually broad and do not present well marked outlines.

In addition to the all pervading sanidine, a large number of columnar-shaped prisms of a green monoclinic mineral are scattered irregularly over the surface of the rock. Where the section is thinnest the green color is often discharged and the prisms then become brownish or almost colorless. They are practically without action upon polarized light, and, from their evident shelly structure, I am inclined to regard them as augite. Scattered throughout, there are also numerous minute grains of magnetite, usually rounded, but sometimes presenting sharp angles.

A few other outcrops of rocks with a generally trachytic aspect may be briefly noticed.

Nareen.—Amongst about a dozen slides prepared from the rocks of this locality, I find that the sanidines are mostly lath-shaped, rarely tabular, and exhibit fluxion structure. The rocks are, however, principally remarkable for the occurrence in them of opal, which appears to fill tolerably large spaces formerly occupied by other minerals, and mainly, I think, by the felspars. Usually it is without action on polarized light, but occasionally polarizes vividly in slender fibres radiating from a centre. This phenomenon is explained by Michel Lévy and Fouqué as due to contraction. Included in the opal there appear to be flakes, or rather nests, of tridymite, but on this point I am not certain. In hand specimens the rock is dark grey, and, though undoubtedly weathered, is still hard and tough. It is used locally as a building stone. The specific gravity of the rock is 2·44; the percentage of silica is 57·89 and of water 3·49. The other ingredients have not been finally estimated.

A similar rock, also with opaline enclosures, occurs in a creek at the foot of Den Hills, a few miles to the west.

Wando Dale.—Between Konong Wotong and Wando Dale there are three successive hills, or, rather, low ranges, over which the road passes. For some time they puzzled me as I drove across them, but a search revealed small outcrops of the usual trachytic rocks on all of them. Though the rocks themselves are certainly somewhat decomposed, the porphyritic sanidine crystals, which glisten on their surfaces, are of good size and very perfect. At the top of one of the hills blocks of brick red kaolin have been dug out and attract the attention of the curious. Close to Wando Dale Station the trachytic rocks rest directly on the crystalline schists, which are strongly developed in the bed of the River Wando, just below Mr. William Moody's house. On one occasion I travelled in a northerly direction from Phoines, near Carapook, through the romantic rocky scenery of Killiecrankie to Wando Dale, and for nearly the whole distance, about 13 miles, the trachytic rocks were in sight.

Phoines.—In his "Geology and Physical Geography of Victoria," Mr. Réginald Murray refers to a dark-colored and dense greenstone which is exposed in the bed of McPherson's Creek. In outward appearance it much resembles the rocks from the neighboring locality of Carapook, though less fissile and perhaps even fresher looking. In microscopic slides it shows much sanidine, generally in lath-shaped, and, rarely, tabular crystals; the latter, however, when they occur, are exceptionally clear and pellucid. There is also abundance of brown, and a very little green augite. Other minerals may be present, but I have not had time to study this interesting rock as closely as it deserves.

With regard to the geological age of the trachytoid series of rocks in this district I have little to add to what I said before. The tuff containing *Otozamites*, mentioned in my former paper, accompanies a dense rock, which, though it certainly contains some sanidine, departs a good deal from the Carapook type of volcanic rocks. Its specific gravity, viz., 2·87, is, besides, high for a trachyte, and suggests rather a basalt which may belong to a later date than the more acid rocks herein discussed. The

latter, if really younger than the mesozoic strata, which I doubt, must have covered them in some part of the area. Certainly, volcanic rocks, as widely spread as these have been shewn to be, cannot have consisted of dykes only, but must also have flowed out in sheets. In certain places, as at Nareen, Wando Dale, Grit Jurk, Carapook, and Killiecrankie, the underlying rocks are of course visible, and consist either of granite or the fundamental crystalline schists of the area.

EXPLANATION OF PLATE I.

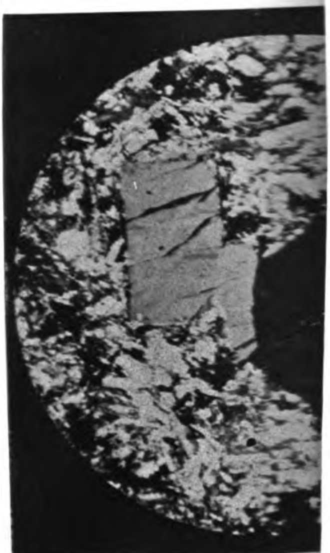
Fig. 1.—A slice from Little Rock, Brit Brit, shewing a mass of small sanidine crystals with large macroscopic ones in the centre of the field. Polarized light, nicols crossed.

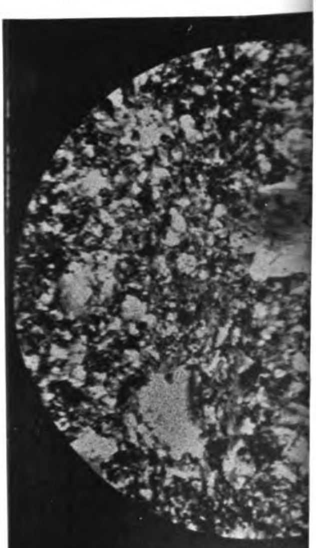
Fig. 2.—Typical trachytic rock from Carapook with a porphyritic twin crystal of sanidine. Polarized light, nicols crossed.

Fig. 3.—Typical trachytic rock from Carapook. The main mass of the rock is sanidine, and scattered through it are columnar crystals of probably augite. Ordinary light.

Fig. 4.—Trachytic rock from Phoines, near Carapook, with sanidine and brown augite. Ordinary light.

All magnified 28 diameters.





Art. III.—*Growth stages in modern Trigonias. belonging to the section Pectinatae.*

By T. S. HALL, M.A.

[Read 13th June, 1901].

The molluscan genus Trigonia Bruguière, has been divided into a series of sections which, though well marked, yet merge into one another so that Lycett considered it inadvisable to erect them into genera or even sub-genera.[1] The living Australian species, he says, are a group apart, and to the section formed by them the name Pectinatae or Pectinidae has been applied. Lycett refers T. subundulata, Jenkins (= T. semiundulata, McCoy), to the same group. The resemblance of this fossil form to the members of the section Costatae had previously been called attention to, but Lycett points out that it differs from that group in that its valves are equal and similar in ornament, whereas in the Costatae a separate description for the two valves is required. It would then appear justifiable to refer all our modern Australian Trigonias to the same group.

The question of the discrimination of our recent species is one of difficulty, for considerable variation is shown both in the shape of the shells and in their ornament, and, probably, the last has not been heard on the question. Four species seem to be generally accepted—T. strangei, T. lamarckii, T. margaritacea, and T. uniophora. To these McCoy added T. acuticostata which he originally described as a fossil, and Tenison Woods described a variety of T. lamarckii to which he applied the name reticulata.[2] Whether this variety is distinct from McCoy's acuticostata and whether that is or is not a variety of a living species I am not prepared to say.

The species from our tertiary beds are: T. subundulata, Jenkins; T. intersitans, Tate (= T. tatei, Pritchard); T. tubulifera, Tate;

1 Palæontographical Society, 1872.

2 Proc. Linn. Soc. N. S. Wales, vol. ii., 1877, p. 125.

T. acuticostata, M'Coy; T. howitti, McCoy, and T. murravica, Tate, the latter being very closely allied to T. howitti.[1]

The recent species are all characterised by the possession of radial ornament alone, concentric ridging being absent, and this feature also occurs in the more recent of the fossil forms, namely T. acuticostata, T. howitti and T. murravica. The remainder, the older members of the group, have a discrepant ornament, radial ridging appearing on the posterior third of the shell and concentric on the anterior part. It is this discrepant ornament which seems to ally them with the more ancient fossil forms, more particularly with Jurassic ones. A close alliance, however, as we have seen, is denied by Lycett, who grouped one of the most typical of those with discrepant ornament, namely, T. subundulata, with the modern radially ribbed Pectinidae. Since Lycett wrote, our other two older tertiary species have been added to the list and belong to the same group.

An examination of the young shells of several of the radially ribbed species shows the justness of Lycett's grouping, for, in all that I have been able to examine, discrepant ornament occurs.

In T. margaritacea the prodissoconch measures 0·2 mm. in breadth, and is smooth.

Trigonia margaritacea, umbonal portion of right valve of a young specimen.

This stage is marked off from the succeeding one, the brephic, by a margining ridge. From this till the shell is about 1 mm. in breadth it has discrepant ornament. On the anterior half of the shell a series of concentric ridges is developed, which are sharp, almost lamellar, marked off by broad, shallow, concave grooves, and separated from one another by some four or five times the width of the ridges. Of these ridges some eight or nine occur.

1 Trans. Roy. Soc. South Australia, vol. xix., 1895, p. 262.

The posterior slope has four or five radiating ridges, which at first are smooth, but soon become nodulose, the most posterior ones being the first to assume this character. As growth proceeds, additional radiating ridges or costulae are intercalated at varying distances from the prodissoconch. The concentric ridges or costae on the anterior part of the shell eventually become broken up into nodules, which later become radially confluent and assume the character of the radiating nodulose ridges of the adult, soon taking on their specific form.

A usually strongly marked feature of the genus is the presence of distinct ridge running from the umbo to the lower posterior angle of the shell, and known as the marginal carina. In the adults of the recent species this marginal carina is comparatively inconspicuous, but in the brephic stage of the present species, T. margaritacea, its position is distinctly marked by a bold radial ridge, which is more pronounced than those posterior to it.

Just as the most dorsal of the posterior radiating ridges are the first to assume the nodulose character of the adult, so the concentric ridges give place to radial ones beginning with their posterior ends, and the ancestral character of discrepant ornament persists longest in the more anterior part of the shell.

Carrying our observations a step further and passing by the adult or ephebic stage—" the period of full development of the individual, when all specific characters are clearly recognizable " —we reach the gerontic stage of Messrs. Buckman and Bather, or the senile of other authors, when " changes take place which are due to a gradual failure of powers." In T. margaritacea the nodules on the radiating ridges become more crowded and less prominent, till finally they disappear among the increasingly rugose lines of growth, while the radiating ridges themselves also fade away and vanish. These signs of failing powers are first shown in the siphonal area, and are here most strongly marked; while towards the anterior the nodules and ridges persist much longer.

In T. lamarckii the stages are similar, the brephic stage showing discrepant ornament.

In T. acuticostata the prodissoconch is like that of T. margaritacea, but the concentric ridges of the brephic stage persist till the shell has attained a breadth of 1·5 mm., and

are about twelve in number. The longer persistence of this character in the fossil is of interest, but my series is too small to say whether we have here a constant difference from T. lamarckii, the species to which it is said to be most closely allied.

Though I have a fairly large number of specimens of T. howitti all have abraded umbos, but a specimen in the cabinet of Rev. A. W. Cresswell shows that, like its congeners it also had discrepant ornament in its youth.

I was anxious to find out if the remaining recent species exhibited the same characters, and, as our Melbourne Museum did not contain the material, I wrote to Mr. C. Hedley, of Sydney, asking him to supply my deficiencies. It appeared that recently Mr. Hedley's attention had been turned to the same point, but he informed me that, as far as he had been able to find out, the facts had not been recorded, and he generously urged me to publish my results.

The drawing is from a young specimen of T. margaritacea given me by Mr. J. H. Gatliff, and to his kindness I also owe an example of T. lamarckii, and the opportunity of examining a series in his cabinet.

If we assume, as seems probable, that concentric ornament is the more archaic form, and due to the accentuation of the incremental lines, and that radial sculpture originated as a breaking up of these lines, then we find, in the Pectinatae, the archaic sculpture persisting longer in the anterior region of the shell, and the more modern first appearing towards the posterior. In the older members of the group, as typified by T. subundulata, this archaic ornamentation persists throughout life towards the anterior end, while in the more modern members it disappears at the close of the brephic stage, being entirely replaced by the more modern form of sculpture. Similarly, in the posterior region the signs of old age first make their appearance, and from thence gradually pass towards the front.

In the older members of the Pectinatae some interesting variations occur. Thus, in T. subundulosa some individuals even from the same stratum, show that the radial lines have transgressed beyond the marginal carina and appear as grooves crossing the concentric costae, thus breaking up the costae into oblong, flattened nodules. The extent to which this occurs is

very variable in different individuals. It may be absent, scarcely discernible, or well marked. In T. intersitans the character is much more advanced, though even here great individual variation occurs. As regards the only other of our species with discrepant ornament, T. tubulifera, I am unable to speak in this respect. The species is small and closely beset with tubular spines, so that the matrix is apt to adhere closely. Pofessor Tate in his original description speaks of one specimen in which the discrepant ornament was scarcely traceable, while in another it was well marked.

SUMMARY.

The recent species, T. margaritacea, T. lamarckii, and the miocene species, T. acuticostata and T. howitti, which are all radially ribbed, show ancestral characters in the discrepant ornament of the brephic stage. The older members of the group Pectinatae, namely, T. subundulosa and T. intersitans, show, in some individuals, a progress towards the ornamentation of the more modern forms. The whole of the facts support the justice of assembling all the species into the single group known as Pectinatae.

Art. IV.—*Contributions to the Palaeontology of the Older Tertiary of Victoria.*

Lamellibranchs.—Part II.

By G. B. PRITCHARD,

Lecturer on Geology, etc., Working Men's College, Melbourne.

(With Plates II. and III.).

[Read 16th May, 1901].

The present paper includes a few interesting species from some of our more important sections, but it is with regret that I am at present unable to include some promised remarks on some of our common Crassatellites and Chiones, there is a good deal of material at present in hand, but I do not yet feel confident enough on certain details to express a definite opinion.

Ostrea hyotis, Linnaeus.

1758. Mytilus hyotis, Linnaeus. Syst. Nat., ed. 10, p. 707.

1899. Ostrea hyotidoidea, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 268.

Locality.—Mornington Clays.

Observations.—This shell was originally determined by Professor Tate as O. hyotis, Linnaeus, and this identification has evidently been accepted by Mr. Harris, of the British Museum, in his Catalogue of Australasian Tertiary Mollusca (see p. 299), as he remarks that "The general contour of the shell (which, however, is extremely variable in regard to details) is that of the living O. hyotis, and it has the characteristic foliaceous scales of that species." Now, Professor Tate, as indicated above, regards our species as distinct, and notes the following points for the distinction: "The fossil species is more depressed, more irregular in outline, the radial ridges less elevated and obtuse, whilst the foliaceous scales very rarely develop into tubular spines." Not having examples of the living species, I am not at present in a position to express a definite opinion.

Arca capulopsis, sp. nov. (Pl. II., Figs. 1, 2).

Description.—Shell elongate, trapeziform, with a very straight hinge, and a strikingly marked hinge area, umbo somewhat conically elevated obliquely, and forwardly directed towards the anterior end. The hinge area extends the full length of the hinge, and occupies a relatively large space between the hinge and umbo, is slightly concavely excavated towards the umbo, the latter being a little elevated above the hinge line from the internal aspect, the hinge area is smooth but for a number of lineations parallel to the hinge, and is strongly angularly marked off from the remainder of the shell.

Posteriorly the shell is again angularly keeled from the umbo to the extreme extension of the posterior margin, the space between this keel and the angulation of the hinge being rather strongly radially ridged, the number of strong ridges being usually about five, and these are crossed by close lamellae parallel to the lines of growth giving rise to frills. The convexity of the umbo is indented medially, the indentation broading somewhat towards the distinct sinus in the otherwise slightly convex ventral margin. Anterior margin slightly convex, posterior somewhat obliquely truncated to the hinge line.

Surface ornamented with closely packed radial ridges, all of which do not reach the umbonal region, the short ridges being usually noticeable towards the anterior end, the ridges are crossed by close lamellae parallel to the lines of growth, the latter occasionally showing as more elevated and irregular ridges.

Internally the anterior margin is a little crenulate.

Dimensions.—Type specimen, antero-posterior diameter, 10 mm.; dorso-ventral diameter posterior to the umbo, 5 mm.; anterior to the umbo, 3·5 mm. Larger specimens give antero-posterior diameter, 15 mm.; and dorso-ventral, posterior 7 mm., anterior, 5·5 mm.

Localities.—Eocene clays of Grice's Creek, Mornington; Type, Eocene clays of Orphanage Hill, Geelong (T. S. Hall); Eocene sandy clays of Corio Bay, Geelong; Miocene sandy clays of Forsyth's section, Grange Burn, probably derived (T. S. Hall).

Limopsis morningtonensis, sp. nov. (Plate II., Fig. 6A).

Description.—Shell roundly quadrate, depressed, slightly oblique, with a small, but prominent acute and incurved umbo. Hinge line somewhat straight or very slightly curved, being about half as long as the greatest antero-posterior diameter, with a well-marked triangular pit immediately under the umbo, with from 5 to 9 anterior teeth, and 4 to 7 posterior teeth of unequal size, the medial ones of each series being strongest. Anteriorly the shell is shorter than posteriorly, with the margin more convexly rounded; posteriorly there is a tendency to angulation at the junction between the margin and the hinge, and again at the junction with the ventral margin. Occasional specimens show greater posterior obliquity, and a somewhat stronger keel from the umbo to the posterior margin. Internally there is a broad flattened margin, with the concavity finely radially striate. Externally the surface is strongly concentrically ridged, the ridges being of unequal strength, some fine, some broad and flattened; a very close, regular and fine radial striation is noticeable under a lens, though it is not, as a rule, visible to the unaided eye, crossing the concentric ridges.

Dimensions. — Type specimen, antero-posterior diameter, 14 mm.; umbo-ventral diameter, 12·5 mm. Other specimens range for the above measurements respectively from 7 mm. by 6·5 mm., 10 mm. by 9 mm., 10 mm. by 10 mm., 13 mm. by 12 mm., up to 18 mm. by 15 mm.

Localities.—Eocene clays near old Cement Works, Balcombe's Bay, Mornington, also Grice's Creek. Eocene clays over Polyzoal Rock, Filter Quarries, Batesford; section near Griffin's Farm, Moorabool River; and Orphanage Hill, Geelong. Eocene, Muddy Creek, Western District. Eocene clays of Gellibrand River, coast section below Curdie's Steps (Type). Eocene, Fishing Point, River Aire.

Observations.—This shell seems sufficiently distinctive to warrant specific designation, and should be easily separated from our other species. It is possible that this is one of the forms that has been confused with the European shell Limopsis aurità, Brocchi, but there is very little difficulty in making out many important distinctive features. Upon comparison with actual

specimens of the European shell it may be noted that the latter is a thicker, more robust and tumid shell, with a narrower hinge, coarser umbo, and trigonal shape, the hinge characters are also distinct, and the external sculpture gives further evidence for separation.

The present species is somewhat analagous to our very common radially ribbed species, but is not as a rule so oblique in form, and has its concentric ridging as a marked feature of contrast, apart from other details. The late Sir F. McCoy identified the common species of this genus from the lower beds of the Spring Creek section near Geelong, as, without doubt identical, on a comparison of actual specimens from English and German localities, with Limopsis aurita, Brocchi, and there is no doubt a very close resemblance in that instance, but I am not yet prepared to make any more definite statement even in this case. The mistake apparently made by Sir F. McCoy, if my interpretation be correct, was in the inclusion of the Mornington fossil as identical with the common Spring Creek form.

Modiola praerupta, sp. nov. (Plate II., Figs. 3, 4).

Description.—Shell elongate-oval, markedly tumid, with terminal umbo, and a remarkably steep slope to the ventral margin.

Anterior end narrow, about half the greatest width of the shell, about the middle line strongly convex and rapidly ascending from the anterior margin for a little more than one-third the length of the shell, thence gradually sloping to the posterior margin, spreading out and becoming flattish post-dorsally.

Ventral margin very straight, anterior margin somewhat rounded, dorsal margin straight for a little less than half the length of the shell, thence slightly convexly rounded to the posterior, then more suddenly convex to the ventral margin. Greatest convexity ranging from the umbo obliquely across the shell to about the junction of the posterior and ventral margins, dorsally from this somewhat deeply excavated anteriorly but rapidly shallowing out posteriorly. Surface with fine and very close lines of growth, also with more or less defined undulations

parallel to the lines of growth, the latter being most noticeable posteriorly, fine radial striations are also just discernible in the neighbourhood of the greatest convexity and on the posterior slope.

Dimensions.—Antero-posterior diameter, 65 mm.; greatest breadth about 35 mm. from anterior margin, about 30 mm.; thickness through one valve, 16 mm.

Locality.—Eocene Septarian Limestones, near the Old Cement Works, Balcombe's Bay, Mornington.

Observations.—Only one species of this genus has hitherto been described amongst our fossils, but this by no means fairly represents the actual occurrences. The species at present described is entirely distinct from M. adelaidensis, Tate, from the Adelaide bore.

Modiola pueblensis, sp. nov. (Pl. III., Fig. 1).

Description.—Shell of medium size, oval-oblong, somewhat tumid, with very prominent, tumid, and incurved umbo, which projects forwards little short of the narrow, convexly rounded, anterior margin. Ventral margin with a slight sinus situated in front of the median portion of the shell, the sinus rapidly shallowing out in its ascent to the greatest convexity of the shell. Shell excavated posterior to and anterior to the umbo, the greatest convexity is at about the anterior third, and the greatest breadth a little posterior to the median line. The margin posterior to the umbo is straight, and rapidly ascends to the region of greatest breadth, thence the descent is convexly rounded, wedging somewhat posteriorly to join the ventral margin.

The surface is marked by slightly irregular, close, flat ridges, conforming to the growth of the shell, the grooves between being much narrower than the ridges, the growth folds interfering somewhat with the regularity of this sculpture; the ridges are most marked anteriorly tending to be less distinct where the convexity of the shell is greatest.

Dimensions. — Type specimen, antero-posterior diameter, 32 mm.; greatest breadth, 17 mm.; breadth at anterior end, about 8 mm.; another specimen, slightly deformed by crushing

but showing both valves in contact, and sufficiently well preserved to give the following: Antero-posterior diameter, 37 mm.; greatest breadth, 18 mm.; greatest thickness through both valves, 16 mm.

Locality.—Eocene, lower beds of the Spring Creek or Bird Rock Bluff, near Geelong.

Observations.—Apparently closely related to M. adelaidensis, Tate, from the Adelaide bore, but differs in relative dimensions, and amongst other features the presence of the ventral sinus, and surface sculpturing serve as features of distinction.

Leda acuticauda, sp. nov. (Pl. III., Figs. 4, 4A).

Description.—Shell small, ovate-subtrigonal, anterior end convexly rounded and shorter than the posterior, the latter being drawn out into a very acutely pointed end.

Umbo prominent and inflated, apparently smooth, and directed slightly towards the posterior, in paired valves the umbones are in contact. The anterior hinge makes, with the posterior hinge, an angle of about 104°, each carrying about twelve to fourteen angular teeth. The posterior hinge line is rather remarkably straight or very slightly concave, while the anterior is slightly convex. Behind the hinge on the posterior slope from the umbo the valve is characteristically flattened, causing a marked posterior keel. Internally the ventral margin is broadly bevelled. The angulation made by the posterior margin with the ventral margin is about 50°, but the junction is so pointed as to appear more acute. Externally the valves are very finely concentrically striate, and usually show irregular growth folds.

Dimensions.—Type specimen, antero-posterior diameter, 7 mm.; umbo ventral diameter, 4 mm.; thickness through both valves, 3 mm.; other specimens range from this to 6 mm. by 4 mm. down to small young examples which measure 3 mm. by 2 mm.

Localities.—Eocene clays of Grice's Creek, and from the clays near the old Cement Works, Balcombe's Bay, Mornington.

Observations.—This species might at first sight be mistaken for L. apiculata, Tate, but upon examination many points of distinction can be readily made out. The present species has a different hinge angulation, a more marked posterior keel, and

sharper posterior termination, a broader and more marked bevelled margin, and lacks the regular concentric threads which mark the whole of the external surface, forming a characteristic of the abovementioned species. It is also closely related to a fairly abundant species from the Lower Spring Creek beds, near Geelong, but it seems advisable to make distinction between the two, and I therefore include the following particulars on the Spring Creek shell.

Leda fontinalis, sp. nov. (Pl. III., Figs. 3, 3A.)

Description.—This species is very similar to the foregoing, and many points in that description apply well to the present form, but the anterior of the shell is not so regularly convexly rounded, having a tendency to be somewhat angled on account of the sudden junction with a very straight ventral margin, and the posterior end of the shell is more acute for the same reason. The valves are deep, so that pairs in conjunction give a very tumid shell for the size; on account of the greater inflation the keeling is more marked and there is a broader flattened area behind the umbones. The hinge teeth are smaller, closer, and slightly more numerous, there being about 15.

Umbones smooth, and earlier portion of the shell with no specially distinct marking, then fairly regular incised concentric grooves, with broad flat spaces between become prominent, with occasional growth folds at irregular distances.

Dimensions. — Type specimen, antero-posterior diameter, 6·5 mm.; umbo-ventral diameter, 4 mm.; thickness through both valves, 4 mm.; another specimen of the same size shows slightly less inflation, being a little under the 4 mm. in thickness; other examples range in their diameters, 6 mm. by 3·5 mm., 5½ mm. by 3·5 mm., and 4·5 m.m. by 3 mm.

Locality.—Eocene, lower beds of the Spring Creek or Bird Rock Bluff Section, near Geelong.

Observations.—This is probably the species referred to under the manuscript name of L. embolos, by Professor Tate.

Carditella regularis, sp. nov. (Pl. II., Fig. 5).

Description.—Shell small, rotund, and convex, with prominent incurved anteriorly directed umbo, and a small but well-defined

deeply excavated lunule. Umbo convexly rounded, and running out to an acute point just above the cardinal area. Outline of the shell very regularly rounded, but for the slight interruption in the neighbourhood of the lunule. Inner margin crenulated from the lower margin of the lunule to the posterior end of the hinge in accordance with the external radial ridges. External surface sculptured with fine close radial ridges, the interspaces being narrower than the ridges, but widest on the posterior slope, and widening towards the margin; ridges number about 28 to 30, and are very regularly and finely beaded, the beads being more rounded in the neighborhood of the umbo, then becoming more oval, and then more oblong towards the ventral margin. Interspaces apparently smooth, but under a good lens show fine concentric markings.

Dimensions.—Antero-posterior diameter, 5 mm.; umbo-ventral diameter, 5 mm.; thickness through one valve, about 2 mm.

Localities.—Type from the Eocene clays of Grice's Creek; also from the clays near the Old Cement Works, Balcombe's Bay, Mornington.

Observations.—The present form appears entirely distinct from any of the five species of this genus already described by Professor Tate, and may be said at first sight to somewhat recall Cardita delicatula, Tate, but its hinge characters are exactly those of Carditella, and at the same time it is smaller on the average, more rotund, more convex, and with finer sculpture, than that species.

Modiolaria balcombei, sp. nov. (Pl. III., Fig. 2).

Description.—Shell small, oblong-oval, very tumid, especially at the umbo and about the umbonal ridge, maximum convexity about the median portion of the shell, thin and nacreous internally.

Umbo very prominent, strongly incurved, and terminal; anterior margin only slightly convex to the ventral margin; the latter showing a distinct sinus, dorsally the margin is convexly rounded, inclined to angulation with the posterior margin, on account of oblique truncation, and again, slightly angled where the umbonal ridge runs out. The whole of the inner margin

finely crenulated. The embryonic shell is well marked, apparently smooth and shining, though very small; the remainder of the shell is finely radially ridged, the ridges being very close, and, as a rule, broader than the intervening spaces, as the shell increases in size fresh ridges make their appearance in the interspaces, at first only thin, but soon reaching the dimensions of the others, so that marginally the ridges are much more numerous; the radial ridges are crossed by concentric growth lamellae, giving rise to a more or less regular cancellation.

Dimensions.—Type, greatest length, 5 mm.; greatest breadth, a little over 3 mm.; greatest convexity, about 2 mm. Other examples give about the same dimensions, save that in some the breadth is a good 3·5 mm.; smaller examples range, length, 3 mm.; breadth, 2 m.m.

Locality.—Eocene clays from the Old Cement Works, Balcombe's Bay, Mornington.

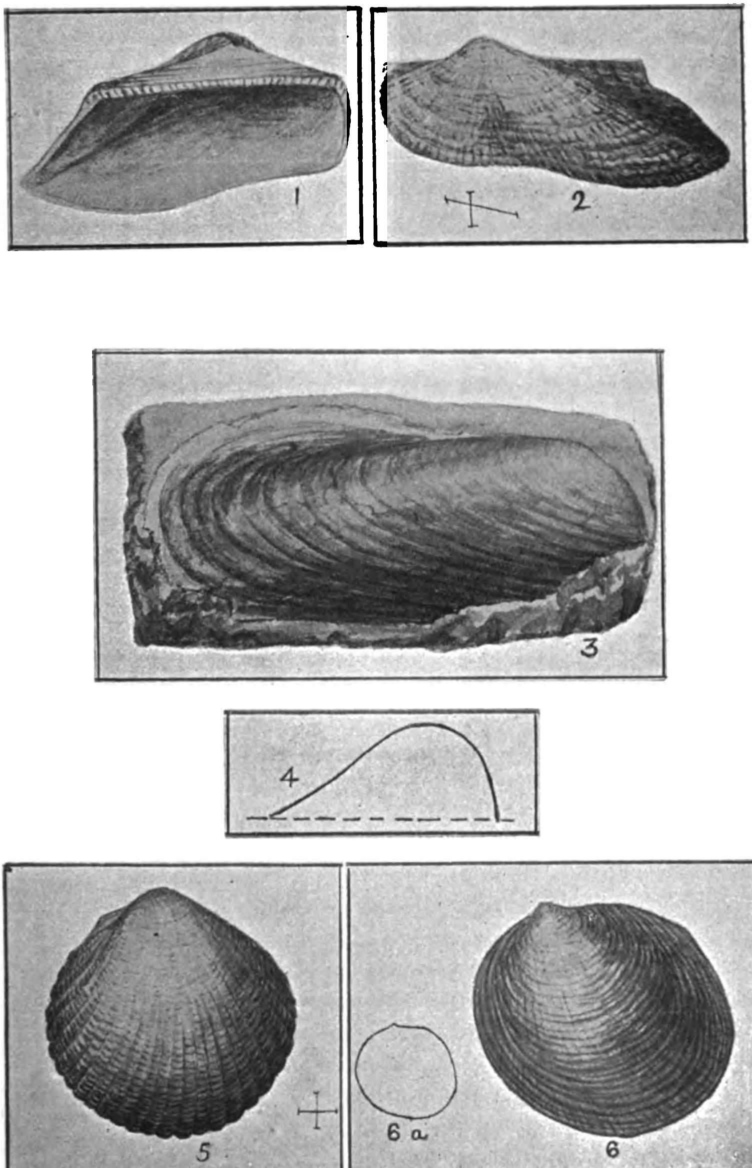
Observations.—Apparently this species is somewhat related to Modiolaria corioensis, Tate, but may be distinguished by being more tumid, and differently sculptured.

Verticordia excavata, sp. nov.

Description.—Shell small, thin, oblong-ovate, with a prominent produced anterior, umbo prominent and incurved anteriorly a little short of the hinge. Shell only slightly convex, somewhat depressed towards the ventral margin, also to the anterior and posterior; deeply excavated immediately in front of the umbo, giving rise to a distinct lunule. Inner margin of valve delicately crenulated, and interior of shell nacreous, with a relatively large anterior adductor muscular impression. Externally the surface is sculptured by narrow acutely angular radial ridges, the interspaces being about twice as broad as the ridges, and very finely transversely striate, ridges number about twenty-eight, and their crests are extremely finely and closely lamellose transversely, the latter feature being most noticeable on the anterior slope, the lamellae apparently being erect.

Dimensions.—Antero-posterior diameter, 6 mm.; umbo-ventral diameter, 5 mm. (incomplete).

Locality.—Eocene clays from near the old Cement Works, Balcombe's Bay, Mornington.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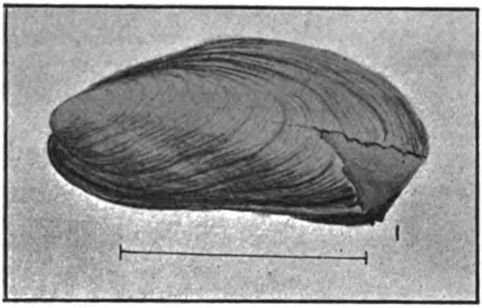
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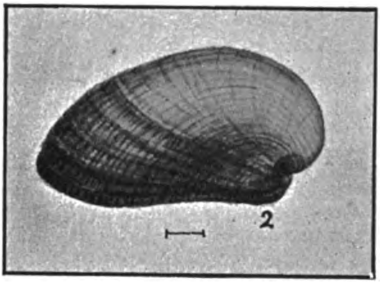
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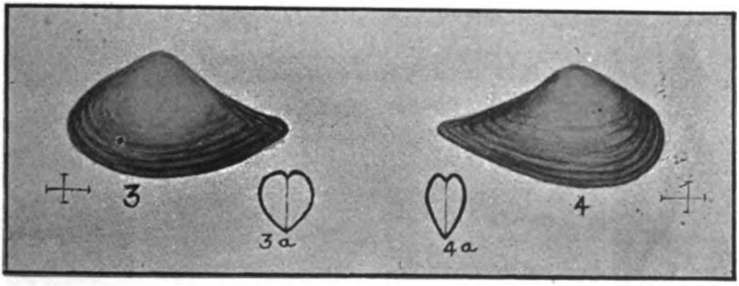
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Observations.—A figure of this species is held over for the present on account of the slightly broken ventral margin. It appears closely related to V. rhomboidea, Tate, but is less inflated, more equilateral, and more finely sculptured.

I am again indebted to Mr. F. E. Grant for the figures with which he has so kindly illustrated this paper.

EXPLANATION OF PLATES.

Plate II.

Fig. 1.—Arca capulopsis, sp. nov.
„ 2.—Arca capulopsis, sp. nov.
„ 3.—Modiola praerupta, sp. nov., sectional view from anterior aspect.
„ 4.—Modiola praerupta, sp. nov.
„ 5.—Carditella regularis, sp. nov.
„ 6.—Limopsis morningtonensis, sp. nov.
„ 6A—Limopsis morningtonensis, sp. nov.

Plate III.

Fig. 1.—Modiola pueblensis, sp. nov.
„ 2.—Modiolaria balcombei, sp. nov.
„ 3.—Leda fontinalis, sp. nov.
„ 3A.—Leda fontinalis, sp. nov., sectional view.
„ 4.—Leda acuticauda, sp. nov., sectional view.
„ 4A.—Leda acuticauda, sp. nov.

ART. V.—*Some Sections illustrating the Geological Structure of the Country about Mornington.*

By T. S. HALL, M.A.,

University of Melbourne;

AND

G. B. PRITCHARD,

Lecturer in Geology in the Working Men's College, Melbourne.

(With Plate IV.)

[Read 16th May, 1901.

Previous Work.

Dr. A. R. C. Selwyn, in 1854, (1) gave a sketch of the geology of the Mornington Peninsula. He compares the blue clay series, both lithologically and as to fossils with the beds of the London and Hampshire basins. The basalt of the coastal sections he refers to dykes, a conclusion from which we dissent. The other formations are described and compared with those of localities outside the area under immediate discussion, a proceeding due to the fact that he was as yet only at the beginning of his work in Victoria, and a rapid examination of the Castlemaine district was almost all he had done. His coloured sections run from Cape Schanck to Mount Martha, from Hawthorn to the Saltwater River near Flemington, and a diagrammatic one illustrates the position of the gold drifts, then a much debated question. Another section, on a scale of about two miles to an inch, runs from near Mornington to the Powlett River, while another is drawn across the Yarra estuary, and is compiled from the results of borings. Finally we have another—a diagrammatic one—across the colony from the Grampians to the Alps. The coloured map shows the the whole of the eastern side of Port Phillip, from the Yarra mouth to the Heads and extending to the eastward nearly as far as Cape Patterson; the scale being two miles to an inch.

Two years later Selwyn (2) published a much fuller report on the district, accompanied by a map on the same scale, but showing greater detail. The section is instructive, but does not touch the area under consideration. It extends from near Somerton to Mount Corhanwarabul (Mount Observatory), and the distance of thirty miles was chained, levelled and drawn to true horizontal and vertical scale, the scale being six inches to a mile. In dealing with the tertiaries twenty-two genera of mollusca are mentioned as occurring in the Mornington clays.

These old reports of Selwyn's, buried as they are in a mass of Parliamentary papers, are not often referred to, but contain a large amount of interesting information. Subsequent explorations have somewhat modified, as is natural, a few of his conclusions, but they still form a safe basis on which we can build, and show how soon he gained a clear insight into the geological structure of Victoria.

Shortly after this, Dr. Selwyn (3) presented a suite of fossils from Mornington to the Royal Society of Tasmania, and the collection is described as showing a close resemblance to forms found at Table Cape.

In 1857 Sir F. M'Coy (4), in his evidence before the Coal Commission, alludes to the small area of "carboniferous deposit" near Schnapper Point, and says that all that area between the granite and the sea was found to be traversed at a little depth by a "sort of dyke" of igneous rock or trap, similar to that which occurs in the Cape Patterson beds on the coast, and similar to that found at a depth of nearly 200ft. in the two more northern borings. Dr. Selwyn, in his evidence before the same commission, said, in reference to Schnapper Point and the shores of Port Phillip Bay, "In this district 200ft. of coal strata have been bored through, and in that thickness no seam more than 3 inches thick has been discovered. If any available coal deposit exists in this neighborhood, it can only be under the waters of Port Phillip. Inland the coal strata are most undoubtedly and completely cut off by being faulted against older rock. This line of fault extends in a direct line from Frankston to Arthur's Seat, parallel to the coast; beyond the latter point, the coal rocks, if existing, are overlaid by such a thickness of newer tertiary deposits as to render them of no practical value."

Two bores were put down, Selwyn says, one near Mordialloc, and after passing through 238ft. of soft sand and clay of the tertiary series, bottomed on a very hard, dense, black rock, or basalt. The second was commenced near Frankston, on the Nine-Mile Beach, and has been carried to a depth of 172ft. Of this, 165ft. was again through clay and sand, and the last 7ft. was partly in sandstone of the old Silurian series, and the remainder again in the dark, very hard trap. Of the bore mentioned as being put down in the "coal strata," we can find no record. Subsequently to this many brief references were made to the fossils and age of the blue clays, chiefly by M'Coy, who at first called them Upper Eocene, and then, accepting the new term Oligocene as its equivalent, changed his references to the age to this.

In 1893 Messrs. Tate and Dennant (5) published a list of about 130 described species of mollusca from Mornington, and referred the beds to Eocene age; while numerous references to the fossils and additional records occur in other papers of these authors, as well as in several of our own.

In 1900 Mr. A. E. Kitson (6) wrote a report on the geology of the district, accompanied by a map and sections. In this paper there is a large amount of detailed description of the exposed sections, and the age of the various beds is discussed, but the consideration of many interesting points is deferred.

Early in the present year Mr. E. G. Hogg published a paper (7) on our Victorian granites, in which the granite rocks of this area were described.

More than ten years ago we began paying attention to the geology of the district, and, besides collecting largely from the various outcrops, have made numerous traverses, while for many years past we have taken students over the ground and discussed the more important sections with them. The puzzling nature of several of the sections, owing to faulting and to landslips, delayed our earlier publication, but, as we believe that we can add some useful information to that already supplied by Mr. Kitson, we venture on the present paper. The scope of Mr. Kitson's communication renders it unnecessary for us to do much more than to discuss a few of the sections displayed on the coast or in the gullies, and to supply a list of the fossils known to us to occur.

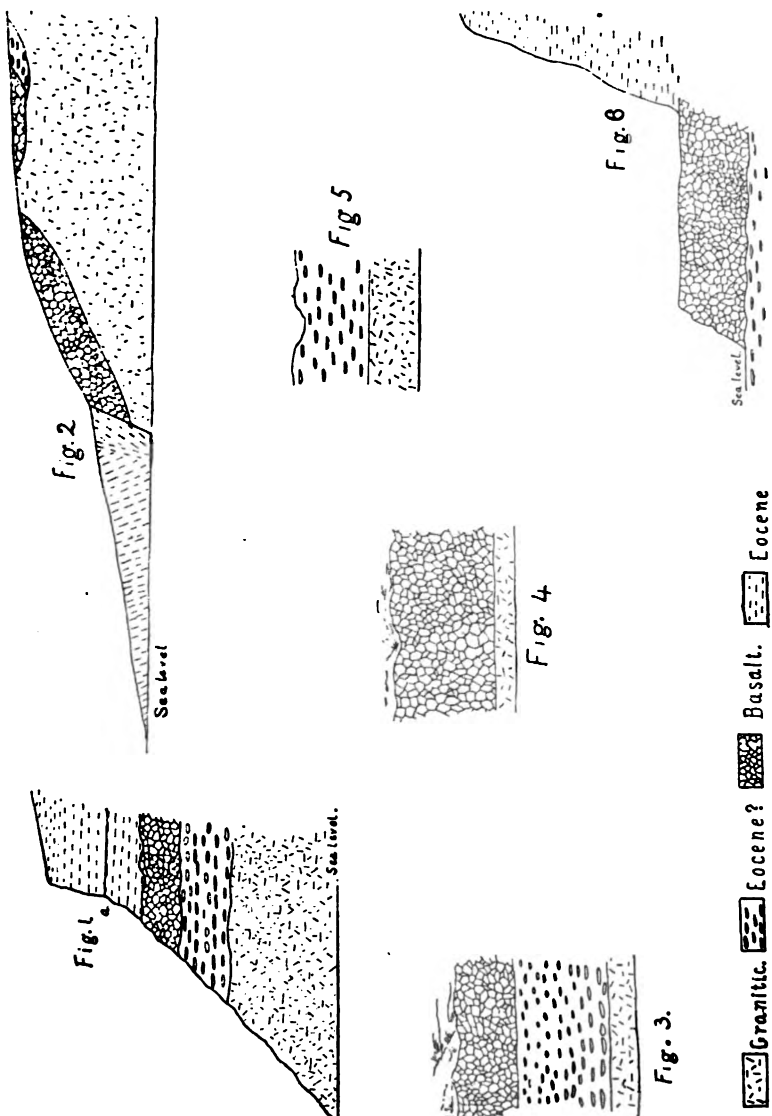
Fig. 1
a
Sea level.
Fig. 2
Sea level
Fig. 3.
Fig. 4
Fig 5
Fig. 6
Sea level
Granitic.
Eocene?
Basalt.
Eocene

Considerable confusion appears to exist as to the names of the small creeks or gullies which run down to the Bay, and we use the local names as far as we have been able to ascertain them. As a matter of fact many of them are too small to have widely recognised ones, and generally bear the name of the owner of the land through which they run, and to these facts is due the deviations which Mr. Kitson's map shows from local usage.

The Sections.

Frankston Brickyard.

In the yard of the Frankston Brick Company, south of the pier, the succession is—

Red sands, grits and white clay
Basaltic clay
Conglomerate (?)
Granite rock.

The granitic rock was reached in a well put down for water and the spoil heap appears to show the presence of the conglomerate. Considerable slipping has taken place at some spots. A shaft was put down a few years ago in search for coal at about low tide mark, slightly to the north of this spot, but all traces have now been washed away.

Sweetwater Creek.

The road cutting near the mouth of Sweetwater Creek (Naringalling Creek of Mr. Kitson) is through a landslip, but the true succession can easily be made out on the hill. We get :—

Red sands, grits and white clay
Basalt
Conglomerate
Granite rock.

In places there is considerable displacement by slipping, and apparently the whole face has come down without, however, much disturbing the order of the beds. About 25 years ago, according to Mr. B. Baxter, a local resident, a considerable fall took place, which completely blocked the traffic, and fragments of the basaltic rock are still to be seen on the beach, evidently derived from this or previous landslips.

Oliver's Point.

This is the first high cliff south of Frankston. The section shows—

Ferruginous grits and sands passing up into white sands (Eocene) - -	45 feet.
Decomposed basalt - - - - -	10 „
Grits with overlying conglomerate - -	10 „
Granite [1] - - - - - - -	27 „
Total - - - - - - -	92 feet.

The ferruginous grits have not as yet yielded fossils at this locality.

Landslip Point. (Fig. 1).

The succession is the same as at Oliver's Point, and the thickness of the beds is practically the same. An interesting point about the section is the occcurrence of a band, a few inches thick, full of casts of fossils at about 20 feet above the top of the basalt, the occurrence of which was first detected by Mr. Kitson, and which was referred by Mr. Dennant to Eocene age.

The fossiliferous band is much softer than the thick-bedded, well-jointed, hard ironstone grits which underlie it, and blocks of which thickly strew the beach below. At the date of our last visit, in December of last year, pieces of the fossiliferous rock were common on the beach owing to a rockfall which took place during the winter, but owing to their soft condition they will probably soon be broken up by the hard shingle. The determination of the Eocene age of the ferruginous grits which mantle the surface of the district up to about 400 feet above the sea, is of considerable interest. Hitherto, in the absence of fossils, these beds have generally been considered as to the same age as those displayed in the Beaumaris cliffs.[2] When, however, the fossils of the two localities are compared, it will be seen that they are entirely distinct, and that those from the grits of this

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1 See Hogg, E.G. (7).

2 The Beaumaris beds have frequently been referred to by authors as at Brighton, Cheltenham or Mordialloc. In each case the same short cliff section is meant, and the small settlement which has of late years sprung up at the spot bears the name which we use.

district show a close agreement with those of the grey clays of Balcombe's Bay, and there is little but a lithological distinction to separate them.

South of Landslip Point.

Mr. Kitson figures and describes a section running south along the coast from Landslip Point, which displays some rather puzzling features. The conclusion that we have arrived at is that the beds owe their present position entirely to landslips. At one time we were inclined to call in the agency of faulting to explain the fact that the basalt and granitite abutted against one another with a vertical wall, but recent examination shows that there is between the two igneous rocks a seam of conglomerate in the upper part of the northern occurrence. This conglomerate also overlies both granitite and basalt, and, as it is the slate conglomerate, which in all the neighbouring sections underlies the basalt, its anomolous position was commented upon by Mr. Kitson, who suggested slipping as an explanation. We are, however, inclined to go further than he does, and ascribe the position of the basalt to the same cause.

Grice's Creek. (Figs. 2 to 5).[1]

At the mouth of the creek the relations of the beds are, at first sight, not easily determined, but by observing the sequence shown in other places in the neighbourhood, become sufficiently clear. Beginning from the sea coast we find the grey, Eocene clays with limestone bands showing a high dip, the figures being, N. 5°, W. at 28°, and gradually increasing to N. 20°, W. at 58°. A few yards further and a reversal takes place, the direction and amount being, W. 10°, N. at 72°, this giving place almost immediately to the slightly lower dip of 67° in the same direction. The beds are then succeeded by basalt, which occupies the bed of the stream for nearly a chain, and over which the ascent is steep. An outcrop of granitite (?) then occurs for 30 feet, when a small patch of basalt again appears. At a height of 45 feet above sea

[1] This locality is referred to by M'Coy in his Prodromus of the Palaeontology of Victoria and elsewhere, as the Mount Eliza beds, a fact for which we are indebted to Mr. J. A. Kershaw, curator of the National Museum.

level, and about a quarter of a mile from the coast a section (Fig. 3) shows :—

Basalt - - - - - - -	5 feet.
Sands - - - - - - -	15 ,,
Conglomerate - - - - -	2 ,,
Granitic rock - - - - -	4 ,,

The dip of the conglomerate floor, on which the basalt rests, is W. 30°, N. at 10°. It is clear that the conglomerate and basalt occupy a small trough in the granitic rock, as a few yards further down the creek the base of the conglomerate rises gradually to 10 feet above the bed, while going up stream we ascend to 60 feet above the sea before we again find basalt on the floor, its base rising more rapidly than the stream bed. At about half a mile from the mouth the creek bed is 80 feet above sea level, and a good section (Fig. 4) shows a cliff of 30 feet of basalt overlying the granitic rock without the intervention of the sands and conglomerates. From this point upwards the course of the stream for some distance has a very gentle fall, granitic rock occupying the bed for the whole distance. At 90 feet above the sea the section displayed (Fig. 5) shows 15 feet of granitic rock overlain by 20 feet of a conglomerate, chiefly composed, as are the others under the basalt here, of pebbles of slate and quartzite. The surface of the granitite (?) is uneven, and, at a height of 120 feet, we find decomposed basalt in the creek bed, which is again succeeded, as we ascend the valley, by the granitic rock.

At about 180 yards from the road, and at a height of 160 feet, we reach the top of the last granitic outcrop, and between this and the road, at a height of 230 feet, we find only ferruginous grits. The top of the granitic rock is much weathered, and, as the base of the grits much resembles it, an exact line of separation cannot be drawn. The ferruginous grits, at an elevation of 190 feet, have yielded obscure plant remains.

South of Grice's Creek.

On passing southwards from the mouth of Grice's Creek we find the Marine Eocene dipping south at about 25°, but a change of direction to the north soon takes place, and the calcareous bands can be seen striking out to sea in a westerly direction

along the beach floor. We then find basalt, and under it on the beach olive shales with Angiopteridium spathulatum (syn. Taeniopteris daintreei) and Thinnfeldia odontopteroides. Abutting on these Jurassic beds is the granitic rock, capped and masked by ferruginous sands. The fact that the Jurassic series owes its position to being faulted down against the plutonic rock was, as mentioned above, long ago stated by Selwyn, and a mile and a half inland the latter rock still rises to a height of over 500 feet.

Balcombe's Bay.

Near the northern end of the shallow indentation known as Balcombe's Bay is the well-known fossiliferous outcrop of Eocene clays and limestones.[1]

The limestone strings and bands were formerly used for making cement, and the ruins of the works are still to be seen. As is shown by the limestone bands, the clays are somewhat disturbed; in one place, north of the cement works, the dip is—E., 25° N, at 16°, but changes rapidly in amount and direction, and occasional sigmoidal curvature of the outcrop, shows the existence of slight contortion, with a dip of from 15° to 20°. Close to the cement works, the beds dip steadily towards the south-west. If this dip held, they would pass under the extension of the basalt which forms the base of the small point to the south; but, judging by what we see elsewhere, they do not.

On rounding this point, the character of the beds is entirely changed, and from sea level to a few feet above high-water mark, we find grits and light conglomerates, with pebbles of quartz and slate, and interspersed with bands of lignite and carbonised tree-trunks. Dicotyledonous leaves are plentiful, and no trace of Jurassic plants is to be seen. The strata are fairly horizontal, but current-bedded. Over these beds, and not apparently separable by an unconformity from them, occurs a series of strata of different character. These are lavender-coloured and yellow sandy clays, with a considerable amount of gypsum and copia-

1 Like many of our longer known geological localities, which were found when geographical names were not so thickly scattered as they are now, this outcrop is known by many designations, such as Schnapper Point, Mornington, Mount Martha, or even Hobson's Bay, though the Bay is thirty miles away. Probably "near the mouth of the River Yarra" also refers to this spot, and was near enough when it was written.

pite (?). We have never been able to find any undoubted fossils in the cliffs about here, though we have frequently searched for them. The general appearance and character of the beds resembles that of the marine Eocenes at various localities, and the amount of gypsum present suggests its derivation from calcareous organisms. We see no reason why these beds should not be classed with the blue clays which, in all probability, they succeeded. About a quarter of a mile south of the point mentioned above, and at which the lignitic conglomerates appear, we find another peculiar section (Fig. 6). The grits and conglomerates can be traced passing under a small mass of basalt, which shows well-developed tabular jointing. The base of the basalt, where it rests on the underlying beds, is vesicular, or rather, amygdaloidal, and becomes denser as we ascend. It abuts against the cliff, which is formed of variegated sands and clays, passing up into ferruginous beds near the top of the cliff. The actual junction of the basalt with the undisturbed strata of the cliff is masked, but the beds can be readily traced along the cliff to the northward, where, as we just stated, they overlie the lignitic series, with no clear break, and without any trace of the basalt being intercalated between them. In fact, there is no basalt shown along the cliffs, though a couple of islets and a small patch visible on the beach at low water connect the two points, which are preserved by their basaltic sea-fronts. The fact that the lignitic beds underlie the basalt, and can be traced horizontally till they underlie the gypsiferous sandy clays to the north, puts faulting out of the question, though, at first sight, the nearly straight line which the shoreward edge of the basalt shows suggests it. There remain two other possible explanations of the section. One is that we are dealing with a narrow flow of lava which has passed down an eroded valley which cut through the upper sandy beds till the lignitic series was reached.

The objections to this view are, firstly, that the cliff above the tabular basalt rises steeply, and the bedding is distinct and fairly horizontal, and we cannot suppose such a valley-wall to have persisted in incoherent material from the time when the basalt was poured out, for the basalt precedes the blue Eocene clays with fossils. The other objection is that if, as we suppose, the sandy

beds represent the marine eocene, then they should be subsequent to the basalt.

The alternative explanation is that there really was a considerable lapse of time between the deposition of the lignitic series and the overlying beds, and that the basalt represents a denuded portion of a sheet which has almost entirely disappeared, and that, after its partial removal, the sandy beds were laid down, partly on the lignitic series and partly on the basalt. The passage of the beds in this case would be only apparent, and due to the fact that the first-formed portion of the upper beds was derived from the waste of the lower. This explanation is the one we adopt.

Succession of the Rocks.

We give the following as, in our opinion, the sequence of the beds :—

Bleached sands, clays and alluvium	Eocene to Recent.
Ferruginous grits, sands and clays Blue and grey clays and gypsiferous sands Basalt	Eocene.
Slaty conglomerate and lignitic beds	? Eocene.
Shales and sandstones	Jurassic.
Granitic rocks.	
Slates, &c.	? Silurian or Ordovician.

Silurian or Ordovician?

The series of highly-inclined rocks is clearly antecedent to the granitic rock, as small dykes and sills of the latter occur in the Moorooduc quarry. Hitherto we have been unable to find any fossils in these rocks *in situ*. The coarse conglomerate which underlies the basalt in many places appears to be, in the main, derived from the older paleozoic sedimentary rocks of the district and from the granitic series. In two places, namely, in the first cutting on the coast road south of Frankston, and near the first outcrop of granitic rock south again from this place, on the shore we have found a few graptolites in slate pebbles. They are very indistinct, and, beyond saying that they are species of Diplograptus, we do not at present care to venture. Their evidence, then, leaves the age of the rocks still open.

Granitic Rocks.

Mr. E. G. Hogg, as already mentioned, has described some of these rocks, and calls the Frankston ones granitites and the Mount Martha ones syenites, hornblende being present.

Jurassic.

The presence of Angiopteridium spathulatum and Thinnfeldia odontopteroides at the outcrop on the beach south of Grice's Creek appears to correlate these beds with those of Bellarine, which are exposed less than twenty miles off, across Port Phillip Bay. These are generally referred to Jurassic age.

The occurrence of faulting to account for the present position of the beds has already been referred to, and no other outcrop of the series is known in the area with which we are dealing.

Slaty Conglomerate and Lignitic Series.

The character of the conglomerates and sands underlying the basalt has been described in detail by Mr. Kitson, and there is little to add to it.

The lignitic series, or leaf beds, exposed to the south of the blue, marine, fossiliferous clays of Balcombe's Bay are of a similar character. Fragments of slate and indurated sandstone, quartz, both black and white, and sand of granitic origin are equally in evidence in the two sets of strata, and, as we have shown, the lignitic beds pass beneath the vesicular base of the basalt. For these reasons we regard the lignites and conglomerates as of the same age. The thick sheets of leaves contain many that are clearly dicotyledonous, while small fruits or seeds are not uncommon; but, so far, nothing has been done with them. It would appear, from the sections displayed in Grice's Creek, that considerable denudation had taken place in these beds before the outpouring of the basalt, for we find them in some places forming a thick deposit of conglomerate and sand. In other places, again, and that in close proximity, they are only a few inches thick, or even may be absent, and in that case we find the basalt reposing directly on the granitic rock. The basalt itself was also much denuded before the subsidence which resulted in the deposition of the marine series upon it. It is, of

course, possible that, as the basalt flowed over the uneven surface of the ground, some localities were left uncovered, and the denudation may be more apparent than real, and that absence of the rock does not imply removal. There is no evidence, for instance, that it ever covered Mount Eliza, which is about 500 feet high, and the probability is that it merely flowed round it, and sent prolongations up the valleys. In one instance, however, we have described what we believe to be a clear instance of denudation of the basalt before the deposition of the marine Eocene, and this is where we described it as overlying the lignites in Balcombe's Bay.

These periods of denudation clearly indicate a lapse of time, and, in the absence of critical palæontological evidence, the age of the conglomerates must be left undecided, for we are, as yet, unable to estimate the time which elapsed between their deposition and that of the marine Eocene. They may be Eocene or they may be Cretaceous, though in our table we class them as Eocene, but with hesitation.

Basalt.

No petrological examination of the basaltic rock has yet been made, so that its exact nature is still uncertain. The basalt is probably of Eocene age.

Blue Clays, &c.

The exact relation of the blue clays to the gypsiferous sandy clays which lie to the south of the cement works is not quite clear. These latter beds pass up into the ferruginous strata which cap the cliffs, whereas the line of demarcation between the ferruginous beds and the blue or yellow clays with fossils is, as a rule, sharp, and, till we examined the fossils of Landslip Point, we were of the opinion that they are of different ages. It seems advisable to regard the beds as mere local modifications of sedimentation, the oxidised condition of the iron being due to greater porosity of the sands. What applies to the ferruginous sands applies with equal force to the gypsiferous sandy clays. In fact, there seems to be some evidence that these do actually overlie the blue clay in Balcombe Bay, for just north of the cement works gypsiferous sands, of a very similar appearance to

those to the south, occur, and, like the beds to the south, are almost, if not entirely, without fossils. It is unfortunate that just at this critical spot, where so much that is of interest could be settled, the whole cliff-face should be scarred with grass and scrub-covered landslips. Possibly the clays were deposited in a spot sheltered from the inroads of sand by a basaltic reef or ridge.

At Grice's Creek, again, there is some difficulty in determining the succession. The blue or grey clays, rich in marine fauna, here dip at a high angle towards the basalt, and then at a still higher angle off it, and upstream the igneous rock rises some distance above sea level, while the base of the clays is hidden below sea level at the Creek mouth. It is evident that we are dealing either with a fault or with a landslip. Close at hand the fault which lets down the mesozoic rock to sea level runs parallel with the coast-line, so that, at first sight, step-faulting might be called to our aid in seeking an explanation. But if the main fault were post-Eocene, we should expect to find some traces of the Jurassics on the upthrow side. But the clear gully section shows no trace of them, so that the presumption is that they were denuded before the Eocenes were laid down, or, in other words, that the faulting did not take place in post-Eocene times. Besides this, the amount of disturbance in the marine Eocene seems to suggest the absence of a great thickness of cover when the movement took place, and to suggest a superficial disturbance rather than a fault. The cliffs in the neighbourhood are much masked, and at present there are not the necessary outcrops to test the question fully. According to our view, then, the present relations of the basalt and the marine clays at Grice's Creek are due merely to landslips, and here, as elsewhere, the clays are younger than the basalt.

Ferruginous Grits.

Ferruginous sands and clays mantle over a great part of the area, and their age is shown to be Eocene by the fossils obtained at Landslip Point. It is, of course, quite within the bounds of possibility that future investigation may show that some of the beds are younger than this; but, in the meantime, we seem justified in referring the ferruginous grits of this district all to the one age.

The character of the beds has been described sufficiently fully by Mr. Kitson, and though, for convenience, we call the beds ferruginous, yet the superficial portions, as is usual in such strata, are bleached more or less completely, and much of the district is covered by a sandy loam.

Post-Eocene.

Since the surface does not seem to have been submerged since Eocene or, possibly, Miocene times, the classification of the subaerially-formed beds is an academic rather than a practical one. The valleys are mostly short and steep on the western slopes, so that any recent alluvium is of small extent. Towards the west and north the low-lying ground is often swampy, and here the beds are of recent age. Mr. Kitson has arrived at the same conclusion, and is content to map a large area as "Eocene? to Holocene," and his map is of great use to anyone wishing to further explore the locality.

It is clear that the western boundary, facing Port Phillip, owes its abrupt rise in the main to the fault which let down the Jurassic freshwater beds. Whether the eastern side of the long, narrow ridge, of which Mount Eliza forms the granitic nucleus, is due to the same cause is not so evident, though quite possible. The descent of the surface is more gradual, except about Moorooduc, and here a small creek, flowing south to enter the sea at Mount Martha, working along the strike of the eastward-dipping palæozoic beds is evidently the cause of the scarp.

The absence of clear sections in many of the critical localities, and the difficulty of interpreting many of the exposures, is due, we believe, to extensive landslips of the soft tertiary beds down the steep western slope towards the Bay. Had the questions involved in a discussion of the geology of this area been easy of solution, an adequate account would long ago have been written. As it is, our interpretation of some of the points at issue may not be the correct one, but it is better to have some definite basis for future work.

We have to thank Messrs. J. A. Kershaw, F. E. Grant, and E. O. Thiele for the gift or loan of fossils which have added several important forms to our list.

LIST OF FOSSILS.

NOTE.—In this list Mornington means the cement works section, and Frankston the ferruginous beds at Landslip Point, and all the identifications it contains have been checked by ourselves.

——	Mornington.	Grice's Creek.	Frankston.
LAMELLIBRANCHIATA.—			
Ostrea hyotis, Linnaeus - - - - -	X		
Dimya dissimilis, Tate - - - - -	X	X	
Placunanomia sella, Tate - - - - -	X		X
Pecten murrayanus, Tate - - - - -	X	X	
,, dichotomalis, Tate - - -	X	X	X
,, sturtianus, Tate - - - -	X	X	
,, yahliensis, T. Woods - - -	X	X	
,, foulcheri, T. Woods - - -	X		
,, lucens, Tate - - - - - -	-	X	
Amusium zitteli, Hutton - - - -	X	X	X
Lima bassii, T. Woods - - - - -	X	X	X
,, linguliformis, Tate - - - -	X		X
Limatula jeffreysiana, Tate - - -	X	X	
Limea transenna, Tate - - - - -	X	X	
Spondylus pseudoradula, McCoy - -	X	X	X
Philobrya bernardi, Tate - - - -	X	-	-
Septifer fenestratus, Tate - - -	X	X	X
Modiola praerupta, Pritchard - - -	X	-	-
Modiolaria singularis, Tate - - -	X	-	
,, balcombei, Pritchard - -	X	-	
Crenella globularis, Tate - - - -	X	-	
Nucula tenisoni, Pritchard - - -	X	X	X
,, atkinsoni, Johnston - - -	X		
,, morundiana, Tate - - -	X		
Leda obolella, Tate - - - - - -	X	X	
,, huttoni, T. Woods - - - -	X	X	
,, apiculata, Tate - - - - -	X	X	
,, acuticauda, Pritchard - - -	X	X	
,, vagans, Tate - - - - - -	X	X	X
,, praelonga, Tate - - - - -	X	-	
,, leptorhyncha, Tate - - - -	X	-	
Poroleda lanceolata, Tate - - -	-	X	

	Mornington.	Grice's Creek.	Frankston.
Limopsis belcheri, Adams & Reeve - -	X	X	
„ morningtonensis, Pritchard- -	X	X	
Glycymeris cainozoicus, T. Woods - -	X		
„ laticostatus, Quoy & Gaimard-	X	X	X
Arca capulopsis, Pritchard - - -	-	X	-
Barbatia crustata, Tate - - - -	X	X	
„ celleporacea, Tate - - -	X	X	X
„ simulans, Tate - - - -	X	X	
Plagiarca cainozoica, Tate - - -	X	X	
Cucullaea corioensis, McCoy - - -	X	X	X
Trigonia tubulifera, Tate - - - -	X	X	
Crassatellites communis, Tate - - -	X	X	
„ dennanti, Tate - - -	X	X	
Mytilicardia alata, Tate - - - -	X	X	
Cardita polynema, Tate - - - -	X	X	
„ delicatula, Tate - - - -	X	X	X
„ scabrosa, Tate - - - -	X	X	
Carditella regularis, Pritchard - - -	X	X	
Diplodonta subquadrata, Tate - - -	X	X	
Chama lamellifera, T. Woods - - -	X	X	X
Verticordia excavata, Pritchard - -	X	-	-
Cardium hemimeris, Tate - - -	X	X	X
„ cuculloides, Tate - - -	X		
Chione cainozoica, T. Woods - - -	X	X	X
Meretrix eburnea, Tate - - - -	X	X	
„ tenuis, Tate - - - -	-	X	
Tellina cainozoica, T. Woods - - -	-	X	
Psammobia aequalis, Tate - - -	X	-	
Semele vesiculosa, Tate - - - -	X	X	
„ krauseana, Tate - - - -	X	X	
Hemimactra howchiniana, Tate - -	X	-	
Myodora tenuilirata, Tate - - -	X	X	
Myochama trapezia, Pritchard - - -	X	X	
Corbula ephamilla, Tate - - - -	X	X	
„ pixidata, Tate - - - -	X	X	X
Cuspidaria subrostrata, Tate - - -	X	-	
Saxicava arctica, Linn. - - - -	-	X	
Capistrocardia fragilis, Tate - - -	X	X	
GASTROPODA.—			
Murex velificus, Tate - - - -	X	X	

	Mornington.	Grice's Creek.	Frankston.
Murex rhysus, Tate	X		
,, eyrei, T. Woods	X	X	
,, amblyceras, Tate	X	X	
,, lophoessus, Tate	X	X	
,, hamiltonensis, Tate	X	X	
,, wallacei, Pritchard	X	X	
,, trochispira, Tate	X	X	
Muricidea camplytropis, Tate	X	X	
,, asperulus, Tate	X	X	
,, polyphyllus, Tate	X	X	
*Typhis disjunctus, Tate	X		
,, acanthopterus, Tate	X	X	
,, laciniatus, Tate	X	X	
Trophon didymus, Tate (Murex)	X	X	
Rapana aculeata, Tate	X	X	
Concholepas antiquata, Tate	X	-	
Argobuccinum maccoyi, Pritchard	X	X	X
Lotorium gibbum, Tate	X	X	
,, cyphum, Tate	X		
,, woodsi, Tate	X	X	
,, textile, Tate	X	X	
,, tortirostre, Tate	X	X	X
,, tumulosum, Tate	X		
,, protensum, Tate	X	X	
,, annectans, Tate	X	X	
,, pratti, T. Woods	X		
Colubraria tenuicostata, T. Woods	X	X	
,, turrita, Tate	X	X	
,, texturata, Tate	X	X	
Fusus dictyotis, Tate	X	X	
,, simulans, Tate	X		
,, senticosus, Tate	X	X	
Clavella bulbodes, Tate	X	X	
Latirofusus aciformis, Tate	X		
,, exilis, Tate	X	X	
,, hexagonalis, Tate	X	X	
Siphonalia longirostris, Tate	X	X	
,, tatei, Cossmann	X		

* Typhis maccoyi, T. Woods, I have collected from the Eocene deposits of the next creek nearer to Frankston than Grice's, but have not hitherto seen even a fragment from Mornington or Grice's Creek.—G. B. P.

———	Mornington.	Grice's Creek.	Frankston.
Siphonalia styliformis, T. Woods - -	X	X	
Tritonofusus crebrigranosus, Tate - -	X		
Solutofusus carinatus, Pritchard - -	X	X	
Fasciolaria cryptoploca, Tate - - -	X	X	
„ decipiens, Tate - - -	X	X	
„ concinna, Tate - - -	X		
„ cristata, Tate - - - -	X	X	
„ rugata, Tate - - - -	X		
„ lamellifera, Tate - - -	X		
„ tenisoni, T. Woods - - -	X ?		
Latirus linteus, Tate - - - -	X	X	
„ murrayanus, Tate - - -	-	X	
„ succinctus, T. Woods - - -	X	X	
„ interlineatus, Tate - - -	-	X	
„ subundulosus, Tate - - -	-	X	
Euthria ino, T. Woods - - - -	X	X	
„ cingulata, Tate - - - -	X	X	
Leucozonia micronema, Tate - - -	X		
„ staminea, Tate - - -	X		
„ tumida, Tate - - - -	X		
Eburna aulocoessa, Tate - - - -	-	X	
Zemira praecursoria, Tate - - -	-	X	
Phos tardicrescens, Tate - - - -	X	X	
Loxotaphrus variciferus, Tate - - -	X	X	
Nassa tatei, T. Woods - - - -	X	X	X
Voluta hannafordi, McCoy - - -	X	X	
„ macdonaldi, Tate - - - -	X		
„ ancilloides, Tate - - - -	X	X	
„ hamiltonensis, Pritchard - -	-	X	
„ maccoyi, T. Woods - - -	X	X	
„ ellipsoidea, Tate - - - -	-	X	
„ sarissa, Tate - - - -	X	X	
„ pseudolirata, Tate - - -	X	X	
„ antiscalaris, McCoy - - -	X	X	
„ strophodon, McCoy - - -	X	X	
„ weldii, T. Woods - - - -	X	X	
„ crassilabrum, Tate - - -	X	-	
Volutoconus limbatus, Tate - - -	X	X	
„ conoidea, Tate - - -	-	X	
Lyria harpularia, Tate - - - -	X	X	X
Mitra alokiza, T. Woods - - - -	X	X	

	Mornington.	Grice's Creek.	Frankston.
Mitra uniplica, Tate	X		
„ paucicostata, Tate	X		
„ leptalea, Tate	X	X	
„ semilaevis, Tate	X	X	
„ conoidalis, Tate	X	X	
„ atractoides, Tate	-	X	
Conomitra ligata, Tate	X	X	
„ othone, T. Woods	X	X	
Marginella propinqua, Tate	X	X	X
„ inermis, Tate	X	X	
„ micula, Tate	X	X	
„ wentworthi, T. Woods	X	X	X
„ winteri, Tate	X		
Ancilla semilaevis, T. Woods	X	X	
„ pseudaustralis, Tate	X	X	
Harpa pulligera, Tate	X	X	
„ spirata, Tate	X		
„ lamellifera, Tate	X		
„ tenuis, Tate	X	X	
Columbella funiculata, T. Woods	X		
„ crebricostata, T. Woods	X	X	
„ cainozoica, T. Woods	X		
„ (?) semicostatus, T. Woods	X	X	
Cancellaria varicifera, T. Woods	X	X	
„ laticostata, T. Woods	X	X	
„ exaltata, Tate	X	X	
„ caperata, Tate	X		
„ calvulata, Tate	X		
„ gradata, Tate	X	X	
Terebra platyspira, Tate	X	X	
Pleurotoma salebrosa, Harris	X		
„ trilirata, Harris	X	X	X ?
„ septemlirata, Harris	-	X	
„ optata, Harris	X	X	
„ clarae, T. Woods	X	X	
„ murndaliana, T. Woods	X	X	
Bathytoma rhomboidalis, T. Woods	X	X	X
„ decomposita, Tate	X ?	X	
Drillia integra, T. Woods	X ?		
„ vixumbilicata, Harris		X	
„ oblongula, Harris	X	X	

	Mornington.	Grice's Creek.	Frankston.
Asthenotoma consutilis, T. Woods - -	X		
Cordiera conospira, Tate - - - - -	X		
Clathurella bidens, T. Woods - - -	X	X	
„ obdita, Harris - - -	X	X	
Buchozia hemiothone, T. Woods - -	X	X	
Mitromorpha daphnelloides, T. Woods -	X		
Daphnella tenuisculpta, T. Woods - -	X		
Teleochilus gracillimum, T. Woods - -	X	X	X
Bela sculptilis, Tate - - - - -	-	X	-
Columbarium acanthostephes, Tate - -	X	X	
„ foliaceum, Tate - - -	X	X	
„ craspedotum, Tate - -	X	X	
Conus cuspidatus, Tate - - - -	X	X	X
„ complicatus, Tate - - - -	X	-	
„ pullulescens, T. Woods - - -	X	-	
„ ligatus, Tate - - - - -	X	X	
„ heterospira, Tate - - - -	X	X	
„ ralphi, T. Woods - - - -	X	-	
„ acrotholoides, Tate - - -	X	-	
„ dennanti, Tate - - - -	X	X	
„ hamiltonensis, Tate - - -	X ?	X	
Cypraea gigas, McCoy - - - -	X	X	
„ gastroplax, McCoy - - -	X	-	-
„ platypyga, McCoy - - -	X	-	
„ leptorhyncha, McCoy - - -	X	X	
„ ampullacea, Tate - - - -	X	-	
„ eximia, McCoy - - - -	X	X	
„ contusa, McCoy - - - -	X	X	
„ pyrulata, Tate - - - -	X	X	
„ subpyrulata, Tate - - -	X	X	X
„ brachypyga, Tate - - -	X	X	
„ murraviana, Tate - - -	X	X	
„ subsidua, Tate - - - -	-	X	
„ scalena, Tate - - - -	X	-	
„ dorsata, Tate - - - -	X	-	
Trivia avellanoides, McCoy - - -	X	X	X
Erato minor, Tate - - - - -	X		
„ morningtonensis, Tate - - -	X	X	
„ australis, Tate - - - -	X		
Semicassis sufflata, T. Woods - - -	X	X	
Morio gradata, Tate - - - -	X	X	

	Mornington.	Grice's Creek.	Frankston.
Natica hamiltonensis, T. Woods - -	X	X	X
„ subnoae, Tate - - - - -	-	X	
„ perspectiva, Tate - - - - -	X	X	
„ polita, T. Woods - - - - -	X	X	
„ limata, Tate - - - - - -	X	X	
„ subinfundibulum, Tate - - -	X	X	
Calyptraea undulata, Tate - - -	X	X	
Crepidula unguiformis, Lamarck - -	X	X	
„ dubitabilis, Tate - - -	X	-	-
Xenophora tatei, Cossmann - - -	X	-	-
Solarium acutum, T. Woods - - -	X	X	X
Heliacus wannonensis, T. Woods - -	X	-	-
Scala foliosa, Tate - - - - - -	X		
„ transenna, Tate - - - - -	X		
„ pleiophylla, Tate - - - - -	X		
Crossea princeps, Tate - - - - -	X		
Turritella platyspira, T. Woods - -	X	X	
„ conspicabilis, Tate - - -	X	X	
„ acricula, Tate - - - - -	X	X	
„ murrayana, Tate - - -	X	X	X
Tenagodes occlusus, T. Woods - - -	X	X	X
Thylacodes conohelix, T. Woods - -	X	X	
„ cratericulus, Tate - - -	X		
„ asper, Tate - - - - -	X		
Eulima danae, T. Woods - - - -	X	X	
„ acutispira, T. Woods - - -	X	X	
Niso psila, T. Woods - - - - -	X	X	
Chileutomia subvaricosa, Tate & Cossmann	X	-	
Mathilda transenna, T. Woods - - -	X	X	
Streblorhampus obesus, Tate & Cossmann	X		
Cerithium apheles, T. Woods - - -	X	X	
Newtoniella cribarioides, T. Woods - -	X	X	
„ eusmilia, T. Woods - -	X	-	
Colina apicilirata, Tate - - - -	X	X	
Triforis wilkinsoni, T. Woods - - -	X	X	
„ sulcata, T. Woods - - -	X	X	
„ planata, T. Woods - - -	X		
Liotia roblini, R. M. Johnston - -	X	X	
Delphinula aster, T. Woods - - -	X	X	
Fissurellidaea malleata, Tate - - -	X		
Subemarginula occlusa, Tate - - -	X	X	

	Mornington.	Grice's Creek.	Frankston.
Emarginula wannonensis, Harris	X	X	
Scaphander tenuis, Harris	X	X	X
Ringicula tatei, Cossmann	X		
„ tenuilirata, Cossmann	X		
Bulinella altiplica, Cossmann	X	X	
„ aratula, Cossmann	X	X	
„ infundibulata, Cossmann	X	X	
„ exigua, T. Woods	-	X	
Roxania scrobiculata, Tate & Cossmann	X	X	
Semiactaeon microplocus, Cossmann	X		
Umbraculum australe, Harris	X		
Limacina tertiaria, Tate	X		
Styliola rangiana, Tate	X		
Vaginella eligmostoma, Tate	X	X	X
SCAPHOPODA.—			
Dentalium aratum, Tate	X	X	X
„ mantelli, Zittel	X	X	
„ subfissura, Tate	X	X	
„ lacteum, Deshayes	X	X	
CEPHALOPODA.—			
Aturia australis, McCoy	X		

SUMMARY.

Mornington	271 species
Grice's Creek	207 „
Frankston	36 „

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EXPLANATION OF PLATE IV.

NOTE—The Scale is 1in.=50ft.

1. Section at Landslip Point.
2. Section at Grice's Creek. The line representing the surface is the creek bed.
3. Section in Grice's Creek, at 45ft. above the sea.
4. Section in Grice's Creek, at 80ft. above the sea.
5. Section in Grice's Creek, at 90ft. above the sea.
6. Section at Point, a quarter of a mile S. of the Cement Works, at Balcombe's Bay.

END OF VOL. XIV., PART I.

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Transactions. Vol. 1. 1855.

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Transactions. Vols. 1–4.

The Society then became:—

ROYAL SOCIETY OF VICTORIA.

Transactions and Proceedings (Vol. 5, *entitled* Transactions). Vol. 5–24.

Transactions. Vol. 1, 2, 3 (part one only), 4. 1888–95.

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MICROSCOPICAL SOCIETY OF VICTORIA.

Journal (Vol. 1, Pt. 1, *entitled* Quarterly Journal). Vol. 1 (Pts. 1 to 4), 2 (Pt. 1), title page and index [*all published*]. 1879–82.

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CONTENTS OF VOLUME XIV.—Pt. II.

Art. VI.—*Some little known Victorian Decapod Crustacea with Description of a New Species.*

By S. W. FULTON and F. E. GRANT.

(With Plate V.)

[Read 8th August, 1901].

Although considerable attention has been paid to the carcinological fauna of the more tropical coasts of Australia, little has so far been done on the marine crustacea of Victoria.

A paper by Dr. Kinnahan,[1] read before the Royal Dublin Society in 1858, recorded the existence of sixteen species from Port Phillip, but these were apparently overlooked by Professor Haswell[2] in his Catalogue of Australian Crustacea in which his records of Victorian habitats are by no means adequate. Professor McCoy[3] has also described and figured a few of our well-known marine forms, and in the Report of the Voyage of the "Challenger,"[4] a number of other species which were dredged in the vicinity of our shores are noted. With these exceptions, however, there has been no attempt at serious work on our marine Decapoda, and we hope that at some subsequent date we may be able to give some additional notes which will be of assistance in an endeavour to make up a census of this part of our fauna.

Tribe—*Cyclometopa.*

Family—*Portunidae.*

Carcinus maenas, Linn.

Linnaeus. Fauna Suecica, p. 492.
Pennant. Brit. Zool. iv., p. 3., pl. iii., fig. 5.

1 Journal of the Royal Dublin Society, vol. i., 1858.
2 Catalogue of the Australian Stalk- and Sessile-eyed Crustacea, 1882.
3 Prodromus of the Zoology of Victoria, 1878-1890.
4 Reports of the Scientific Results of the Exploring Voyage of H.M.S. "Challenger."

1853. Bell. History of the British Stalk-eyed Crustacea, p. 76.

1899. Alcock. Journal of the Asiatic Society of Bengal, vol. lxvii., pt. ii., p. 13.

1900. Fulton and Grant. Victorian Naturalist, vol. xvii., p. 147.

Dr. A. Alcock, in his valuable paper quoted above, in referring to the distribution of the well-known European Shore Crab, states that in addition to its usual habitat, it "has been reported from the Hawaiian Islands, from the Bay of Panama, and though there is doubt about this locality—from Australia."

In a short paper read by us before the Victorian Field Naturalists' Club in November, 1900, and before were were aware of Dr. Alcock's reference, we had recorded its establishment in the waters of Port Phillip. We cannot learn, however, of its occurrence at any other points on the Australian Coast and there seems little doubt that it has been introduced here in the shipping. In confirmation of this we would point out that although exceedingly abundant now, special reference is made to its absence from our fauna in a paper by Dr. Kinnahan, published by the Royal Dublin Society, vol. i., p. 111, in 1856, entitled "Remarks on the Habits and Distribution of Marine Crustacea, on the Eastern shores of Port Phillip, Victoria, Australia, with descriptions of undescribed Species and Genera."

In the after discussion on our paper by the members, Consul Gunnersen suggested that it found its way here from Europe through the medium of the old lumber ships attracted to our Port in the early 50's, on the discovery of the goldfields—many of these vessels were far from seaworthy and had been patched up with false bottoms which had become riddled with Teredo navalis and were fouled with marine growths, affording ample shelter for the fry and young crabs on their long voyage, which would leave the ship on her coming to anchor. This theory might also account for the scattered distribution of this species as indicated by Dr. Alcock.

The Rev. T. R. Stebbing in his "History of the Crustacea," in the International Scientific Series, p. 98, refers to an analagous case of the introduction of species of "Plagusia," to the Mediterranean on the bottom of an iron vessel from Pondicherry, *via* the Cape of Good Hope, in 1873.

Carcinus maenas is exceedingly abundant on the coasts of Europe.

TRIBE—*Brachyura anomala.*

FAMILY—*Dromiidae.*

Platydromia, gen. nov.

Carapace much flattened, subpentagonal, pubescent.

Front bilobed, the lobes divided by a deep sulcation—above this the carapace rises into a prominent arcuate ridge divided into lobes and forming a false front.

Second antennae long and fine.

The fourth pair of ambulatory legs equal the chelae in lenghth. The third pair are very short. The last two pairs of legs are turned up above the first two pairs, but not over the carapace. The penultimate joints of the last four legs are truncate. The dactyli are short and curved.

Abdomen, in both sexes, with seven segments. The sternal sulci of the female terminate between the bases of the first pair of pereipoda in prominent raised ridges which meet in the centre.

Platydromia thomsoni, sp. nov. (Plate V., Figs. 1, 2, 3, 4).

All parts of the carapace are covered with a short harsh tomentum.

Carapace much flattened, and pentagonal in outline—the length from the tip of the frontal processes to the posterior margin equalling the width between the lateral angles. The regions are faintly defined. The "linea amourica" are not present.

The front is formed by two prominent and nearly horizontal teeth, the external edges of which are smooth and turned upwards leaving a large bay between them.

The anterior fifth of the carapace is deeply concave, and terminates posteriorly in a prominent, acute, arcuate ridge, which extends across its greatest breadth and is terminated at each end by the lateral angles which are not spinose. This ridge is slightly thickened and granulate, and is divided into four equal and prominent lobes by three short V shaped sulci, filled with hairs. Immediately behind the lateral angles there is a slight concavity.

On removal of the hairs from the carapace the surface is polished, with a few small pits, but without granules.

The inner part of the pterygostomian region is membranous in consistency.

The *external maxillipeds* are operculiform and covered with a dense pubescence. The ischium is crossed by an oblique elevation which is continued on the hepatic region of the carapace by a prominent crescent-shaped ridge which does not quite reach the posterior lateral margin. The palp is articulated at the antero-lateral angle of the ischium.

The *palate* is well delimited from the epistome. The efferent branchial canals are defined by a distinct ridge.

The *epistome* is triangular and terminates anteriorly in a short ridge which is continuous to the angle formed by the junction of the two lobes of the front.

The *orbits* are well defined posteriorly and terminated anteriorly by the antennulary fossae. The infraorbital margin ends in a prominent ridge which is turned slightly downward—beyond this no teeth are present.

The *first antennae* are short, entirely retractile into pits beneath the lobes of the front, and not visible when viewed from above.

The *second antennae* have a short peduncle which does not extend beyond the orbital margin, and carries a long and fine flagella.

The *eyes* are small and entirely retractile within the orbits.

Legs. The chelipeds are shorter than the first and second pairs of ambulatory legs, and are entirely covered with a dense tomentum, with the exception of the tips of the fingers which are naked. The meros is triangular in section and fringed along its upper edges. The upper surface is flattened with its edges prominent. The hand, which is not robust, is obscurely longitudinally cristate on its outer surface. The fingers are strongly toothed and have between them an open space at their base when closed.

The first and second ambulatory legs have the meros markedly triangular in section—the third and fourth less so—while the carpos and propodos are in all cases quadrangular. All of these joints are slightly dilated and truncated at their distal extremities.

The dactyli are short and curved—those of the last pair being turned forwards, while the others are turned backwards. The first pair are the longest but are nearly equalled by the second, the third are short and rudimentary, and lie above the bases of the second, and the fourth are turned backwards along the sides of the carapace and over the first pair, which they nearly equal in length—all are covered with a dense tomentum except on the tips of the dactyli—and the angles of the joints are fringed with hairs.

The *abdomen* in both sexes is seven jointed—the first, second, and part of the third joints being visible when viewed from above, and bears a median convex ridge.

The abdomen of the male is acutely triangular in shape, but the terminal joint is rounded and obtuse.

The sternal sulci of the female do not meet, but end on the posterior part of the first segment of the sternum and between the bases of the first pair of legs. Each is terminated by a raised curved convolute ridge, excavate behind, the two prominences meeting in the central line.

DIMENSIONS OF TYPE. ♂.

Greatest beadth of carapace - -	10 mm.
Greatest length of carapace - -	10 „
Length of chela - - - -	16 „
Length of 1st ambulatory leg - -	18 „
Length of 2nd ambulatory leg - -	17 „
Length of 3rd ambulatory leg - -	10 „
Length of 4th ambulatory leg - -	15 „

The female specimen (which is imperfect) is slightly larger than the male.

Habitat.—Our specimens were dredged by Mr. J. Gabriel, in Western Port.

Observations.—This species differs so markedly from any others of which we have been able to obtain specimens or to compare the descriptions, that we have been compelled to create a new genus for its reception. Its nearest alliance is with the genus *Dromia*, Fabr., but it does not fall into any of the subgenera as defined by Dr. Alcock (Journal of the Asiatic Society

of Bengal, vol. lxviii., pt. ii., No. 3, 1899). Its distinctive features are the arcuate ridge which crosses the carapace between the lateral angles—and the long pair of fifth legs which lie immediately over the second pair, but cannot be raised above the carapace, and the form and position of the female sulci.

We have much pleasure in dedicating the species to Mr. G. M. Thomson, F.L.S., of Dunedin, from whom we have received much assistance and advice in our work on the Crustacea.

The types have been deposited with the National Museum.

TRIBE—*Thalassinidea.*

FAMILY—*Axiidae.*

Axius plectrorhynchus, Strahl. (Plate V., Figs. 7, 8).

1861. Strahl. Monatsbericht der k. preuss. Akad., p. 1055.

1862. Strahl. Ann. and Mag., Nat. Hist. (3). vol. ix., p. 387.

1884. Miers. Zool. Collection of H.M.S. "Alert," p. 283.

This species was originally described by Strahl, from a single specimen taken at Luzon—and was subsequently identified by Miers as occurring in Torres Straits, a single mutilated specimen being in the collection made by H.M.S. "Alert." We have found it to be plentiful in the crevices of the rotten sandstone reef about 100 yards from the shore at Beaumaris, and about 3 to 4 fathoms below tide mark.

The armature of the carapace appears to be very variable and while we have specimens agreeing closely with both Strahl's and Miers' specific descriptions, we have also others taken with them under circumstances leaving no question as to their belonging to the same species, which differ in many details. This is particularly noticeable in the number of spinules on the front—typically there are eleven of these, but we have specimens with four on one side and six on the other, some have thirteen in all, while a few only agree with the type.

Another feature worthy of note is the presence on the upper surface of the flattened rostrum (in some of our specimens) of

two rows of three small flattened tubercles, which are not referred to in the specific descriptions of either of the authors quoted.

The species does not appear to have been previously figured, and we take this opportunity to do so.

TRIBE—*Thalassinidea*..

FAMILY—*Callianassidae*.

Upogebia simsoni, Thomson. (Plate V., Figs. 5, 6).

G. M. Thomson, Proc. Roy. Soc. Tasmania, 1892, p. 49, pl. 1, figs. 3-5.

This species, which was described by Mr. G. M. Thomson in 1892, from a single specimen collected on the east coast of Tasmania, we have found to be fairly plentiful, burrowing under stones resting on a muddy bottom, below low water mark, inside "Black Head," Flinders, Western Port.

The detailed description given by the author left some doubt in our minds as to the identity of our specimens, and the figure given was of little assistance. Through the kindness of Mr. G. M. Thomson we have, however, been permitted to compare the Victorian examples with the type with which they are in close accord. In case other workers should be confronted with the same difficulties, we have ventured to redescribe the species and figure one of our specimens. The various details mentioned in our description appear to be persistent, little deviation being observed when a series is examined.

We revert to the generic name Upogebia for this species in place of the more usually accepted Gebia, the former name appearing to have undoubted priority.[1]

The *cephalothorax* is laterally compressed, regularly narrowed anteriorly, and somewhat more abruptly posteriorly. It terminates anteriorly in three conspicuous lobes, the median one forming a flattened rostrum. The cervical groove is well marked and two lateral grooves define the position of the branchiae.

The *front* is divided into three parts by two deep grooves

1 Stebbing, History of the Crustacea, p. 185.

which extend backwards and outwards to the margin at the second third of the length of the cephalic region, forming the three lobes above mentioned. The mesial portion forms a somewhat prominent concave rostrum armed on its outer margin with a row of rounded tubercles interspersed with stiff hairs, and reaching almost to the distal end of the first joint of the second antennae. About half-way from the apex a second row of similar tubercles and hairs commences, and as it mounts the cephalothorax these rows become irregular nearly forming a third line. The lateral lobes of the front, which reach about half way to the point of the rostrum, have their margin armed with a single row of tubercles and hairs. Below this on the hepatic region there is a diagonal line of 3 to 4 small tubercles.

Behind the cervical groove the carapace is quite unarmed, but is fringed with hairs on its posterior margin.

The *abdomen* is without epimeral thickenings. The 3rd, 4th, 5th and 6th segments are strongly fringed, but are unarmed above. The 6th segment is subquadrate, and slightly broader than long. It is the longest of the segments, as is typical of the genus.

The *first antennae* which are short, and each furnished with two flagellae—are unarmed and do not bear a basal scale—the flagellae reach slightly beyond the peduncle of the second pair.

The *second antennae* have the second joint of the peduncle armed with two spines on their upper and one on their lower distal margin. The next two joints are clothed above at their distal end with a number of long stiff hairs. The flagellae, which are almost equal in length to the first pair of legs, are armed with long scattered hairs at each articulation.

The *eye stalks* are small, and the eyes are of moderate size.

The *outer maxillipedes* are pediform.

First leg.—The basos has two irregular tubercles near to its distal extremity. The arm is furnished with an acute tooth on its upper border, and with 3 to 5 prominent spines on its lower posterior border. The surface is smooth, with the exception of a few long hairs on the upper border round the spines.

The wrist is carinate, with two prominent sharp spines at its upper, and one at its lower distal extremity, the carina terminating with the inner of the two upper spines.

The hand is large, smooth and flattened, with a few irregular punctations on its lower outer surface. Two large depressions are situated on either side of the articulation of the mobile finger, and are filled with a long, coarse brush of hairs. The upper margin is strongly keeled, the keel is clothed with longitudinal rows of scattered hairs and ends somewhat abruptly at its distal extremity in an acute flattened tooth. The lower margin is armed posteriorly with a series of small, flat, forwardly-projecting teeth, and is somewhat hairy. Its lower distal extremity is extended into a strong, short, rudimentary, inferior finger, which is toothed on its upper margin for its posterior half. The mobile finger is three-fourths as long as the palm. It is slightly curved, flattened and somewhat excavate above, and is triangular in section, with the upper edges strongly denticulate and fringed on the sides with strong hairs, ending in a smooth horny point.

The *second leg*, which is monodactyle, is somewhat larger than the succeeding ones, and is flattened. The arm is clothed with a row of long coarse ciliated hairs. The wrist has its lower distal margin ending in a small tooth, and with the hand and dactylos, is fringed with long hairs. The last two joints are without teeth.

The *third and fourth* legs are more slender than the second, they are not armed with spines or teeth, nor so heavily clothed with hairs.

The *fifth leg* is slender and subchelate, the immobile finger being short spoon-excavate and finely toothed along its upper margin. The last two joints are densely clothed with long hairs, which somewhat conceal the subcheliform structure of the legs.

The *telson* is broadly rounded, medially sulcate, and fringed with stiff hairs.

Uropods.—The uropods are furnished with a bifurcating median ridge, having a sharp tooth at the point of bifurcation and a similar tooth behind it on the preceding joint. The endopod bears a strong rib on its upper margin, and also a single median rib. Both are strongly fringed with hairs.

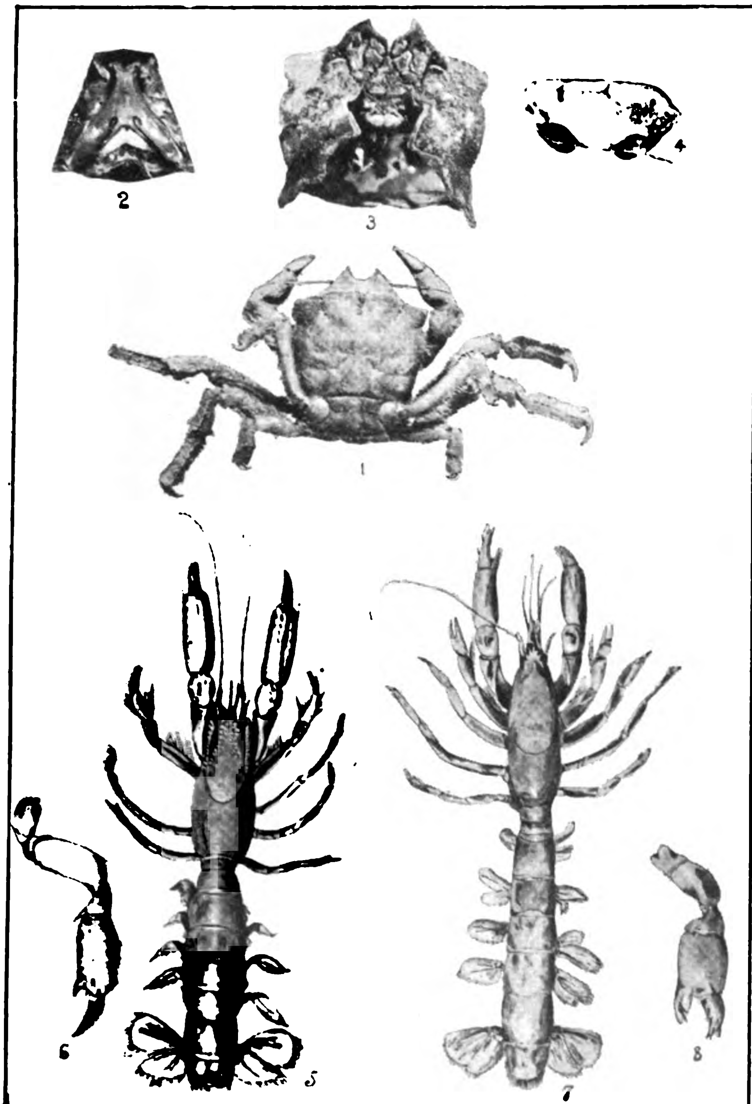
Colour.—Cream-yellow shading to pale pink.

Dimensions.

From point of rostrum to end of telson	-	21·4 mm.
Length of cephalothorax - - - -	-	8·4 „
Length of abdomen - - - - -	-	13·0 „
Length of anterior legs - - - -	-	12·0 „
Breadth of cephalothorax - - - -	-	4·0 „
Breadth of abdomen - - - -	-	4·0 „

DESCRIPTION OF PLATE V.

Fig. 1.—Platydromia thomsoni, sp. nov., adult male ♂, × 2·5.
„ 2.—The same, ♀, sternum, showing sulci, × 2.
„ 3.—The same, ♀, cephalic region, × 2.
„ 4.—The same, anterior view of frontal region, showing form of frontal lobes, and false frontal ridge, × 2·5.
„ 5.—Upogebia simsoni, Thomson, adult ♂, × 1·8.
„ 6.—The same, side view of chelipede, × 1·8.
„ 7.—Axius plectrorhynchus, Strahl, adult ♂, × 2·3.
„ 8.—The same, side view of chelipede, × 2·3.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Art. VII.—*Further Descriptions of the Tertiary Polyzoa of Victoria.—Part VII.*

By C. M. MAPLESTONE.

(With Plates VI., VII. and VIII.).

[Read 12th September, 1901.]

Schizoporella nitidissima, n. sp. (Pl. VII., Fig. 1).

Zoarium encrusting. Zooecia oval, convex; surface rugose, with a row of pores on the margin. 6–8 stout spines on distal end. Thyrostome arched above, proximal margin straight with a narrow sinus. An avicularium on a rugose stem on one side of the zooecia near the base; mandible very acute, with a bar and a semicircular cavity. Primary cell circular, with twelve stout spines round the edge; opening circular, with two denticles probably the points of the attachment of the operculum.

Locality.—Mitchell River (J. Dennant).

A single specimen, and a most interesting one, as it is a young zoarium, and has, what I have never seen recorded in fossil polyzoa, a primary cell; the spines are very short and thick, and probably are the bases of longer spines; the avicularia are also peculiar in having stems.

Schizoporella vigilans, Waters. (Pl. VII., Fig. 2).

I have several specimens of this species which is somewhat variable; some agree with the original description, in having elongated pores all over the surface, others have a single row round the edge and the zoarium is not always quadrilateral, but is always in vincularia form. One specimen bears ooecia, which have not hitherto been described or figured. They are globose and covered with small shallow pits and granulations.

Localities.—Aire Coastal Beds (Hall and Pritchard); Cape Otway (J. Dennant); Curdies Creek (A. W. Waters).

Schizoporella terebrata, n. sp. (Pl. VII., Fig. 3).

Zoarium encrusting. Zooecia undefined; surface slightly granulated, with irregularly disposed pores of various sizes, but occasionally they are in a row, indicating the margin of the zooecia. Thyrostome with a long sinus in the proximal margin. Large raised avicularia, with long acute mandibles, on one side below the thyrostome and in a similar position, sometimes one, occasionally two very narrow slender avicularia with the mandible pointing downwards. Ooecia small, globose, partially immersed, surface rough.

Locality.—Mitchell River (J. Dennant).

In this species the sinus is unusually long and in addition to the avicularia above described, there is, in the portion figured (near the top) a semi-elliptical avicularium with a small projecting plate at one end, and two small pores at the other, sometimes the long narrow ones are reduced in length, and elongated oval in shape.

Schizoporella convexa, McG. (Pl. VII., Fig. 4).

I have specimens of this species from the Mitchell River deposits, which bear ooecia. They are subglobose, adnate upon the ooecia above, with a bordered area in front bearing radiating lines, surrounded distally with a narrow cross-ribbed depressed area and they are remarkably like those of Microporella diadema.

Schizoporella ovalis, n. sp. (Pl. VII., Fig. 5).

Zooecia irregularly hexagonal, ventricose; a row of pores (sometimes two) round the margin, sometimes absent. Thyrostome small, subtriangular, with a very narrow sinus. Avicularia elongated oval, slightly raised, with mandibular cavity pointing distally.

Locality.—Mitchell River (J. Dennant).

In the place of the ooecia in this species there are suborbicular smooth concave areas with raised margins which probably represent the dorsal walls of orbicular ooecia, but as they are perfectly smooth it is possible they may be deeply immersed ooecia: therefore, as it is uncertain which they are, I have not included them in the specific description.

Schizoporella mamillata, n. sp. (Pl. VII., Fig. 6).

Zooecia elongated, oblong, flat; surface covered with large mamillæ, between which are a few minute perforations. Thyrostome arched above, proximal margin with a long narrow sinus slightly contracted in the middle. A small oval avicularium, furnished with a bar, below and close to the thyrostome on one side of some zooecia.

Locality.—Jimmys Point, Reeves River (J. Dennant).

The zooecia vary considerably in size, but the species may be easily distinguished by the large and uniform size of the mamillae.

Schizoporella pulvinata, n. sp. (Pl. VII., Fig. 7).

Zooecia small, oval; the central part with a large raised oval area, the centre of which has a longitudinal cleft or depression; some zooecia are perforated with a few small pores. Thyrostome small, arched above, with a very small sinus in the lower lip; a small hemispherical umbo sometimes present above it. Ooecia globose.

Locality.—Clifton Bank, Muddy Creek (T. S. Hall).

This is a very curious specimen, it is adherent on the interior of a bivalve shell, and the large oval elevated area occupies almost the whole front of the zooecia, obscuring in almost every case the proximal part of the thyrostome. The two perfect ooecia figured have their opercula in sitû.

Schizoporella hispida, n. sp. (Pl. VII., Fig. 8).

Zoarium encrusting. Zooecia oval, ventricose; covered with rough irregular tubercles. Thyrostome arched above, with a narrow sinus in the lower margin. Ooecia globose, subimmersed, very rugose.

Locality.—Muddy Creek (H. Butler).

I do not know which bed this came from. I received it many years ago when at Portland. It is remarkable for the very rough irregular tubercles all over the surface and very difficult to represent.

Schizoporella subgranulata, n. sp. (Pl. VII., Fig. 9).

Zooecia broad, hexagonal, with smooth small regular granulations. Thyrostome arched above; rather shallow sinus in lower margin. A very small oval avicularium on a raised rounded base immediately below the thyrostome.

Locality.—Cape Otway (J. Dennant).

A single specimen with four perfect zooecia.

Schizoporella flabellata, n. sp. (Pl. VIII., Figs. 10, 10*a*.)

Zoarium flabellate. Zooecia oval or vasiform; surface punctured. Thyrostome orbicular, sinus moderate.

Locality.—Jimmys Point, Reeves River (J. Dennant).

This species is remarkable for the very elegant flabellate form of the zoarium. The zooecia are regularly arranged on both sides of a calcareous lamina, on the margins of which are narrow ridges, presumably the first part formed of the young zooecia. The zooecia on this specimen are much worn, but there was a small fragment with zooecia perfect from which Fig. 10*a* is drawn.

Schizoporella fenestrata, Waters. S. profunda, McG. (Pl. VIII., Fig. 11).

Dr. MacGillivray described and figured in his Monograph of the Tertiary Polyzoa of Victoria (p. 83, pl. xi., Fig. 14.) S. profunda, and gives as a synonym "?S. fenestrata, Waters," but does not mention any particulars in which his species differs from that of Mr. Waters. A comparison of the descriptions (Mr. Waters gives no figure) seems to show that they are not identical, the principal character in common being the great depression in which the thyrostome is placed, but the specimen from which Fig. 11 is drawn enables me to reconcile the differences. In this specimen the zooecia are "indistinct," as described by Mr. Waters[1] (S. fenestrata), but I have others in which they are "separated by narrow raised lines" (S. profunda). There are very large avicularia "between the zooecia" (S. fenestrata) and also on the "extreme lateral zooecia" (S. profunda). In the description of S. fenestrata no mention is made of any spines

[1] Q.J.G.S., vol xxxvii., p. 339.

above the thyrostome, and S. profunda is said to have about five. Generally there are none, but I have found traces of them in some of the infertile zooecia of the specimen figured, but had I not specially looked for them they would not have been noticed. The great depression in which the thyrostome is placed is a most conspicuous feature in all the specimens, and in worn ones it is the only characteristic visible. The ooecia are not mentioned by either Dr. MacGillivray, or Mr. Waters.

My specimen is from the Gellibrand River deposits. It is in very good preservation, about half an inch long, broadly ligulate in form, with a bifurcation, the zooecia are on both sides. There are many large avicularia both between the zooecia and on the margin of the zoarium: these have a longitudinally curved mandible 0·5 mm. long, a crossbar with a central ligula and sometimes two lateral ones also. The semicircular area behind the crossbar is divided into two parts by another slightly curved crossbar; these, when broken, are probably what Mr. Waters refers to as the large avicularia with "numerous denticles." The oval avicularia have also a crossbar with a central ligula. There are also a small circular avicularia scattered over the surface. The ooecia are large, globose and smooth.

I have described the points in which S. profunda, and S. fenestrata agree, and in which they differ at some length, because without explanation their identify would not be perceived, for my figure differs greatly from that given by Dr. MacGillivray; his does not show any avicularia, nor is the great depression in which the thyrostome is placed apparent. An examination of specimens of S. profunda in the National Museum, confirms my conclusions; consequently that species must lapse.

Schizoporella variabilis, n. sp. (Pl. VIII., Fig. 12).

Zoarium ligulate, apparently in short internodes. Zooecia on both faces. Zooecia irregularly oval, surface either rugose or mamillated. Thyrostome depressed, orbicular, with a rounded sinus; margin raised. Large avicularia situated below, or on one side of the thyrostome; occasionally a small oval avicularium near the proximal part. Ooecia globose, subimmersed.

Locality.—Aire Coastal Beds (Hall and Pritchard).

The dorsal surfaces of the ooecia only are visible, the front has broken away. The species is very variable, in some specimens the surface of the zooecia is simply somewhat irregular, in others covered with large mamillae completely obscuring the shape of the zooecia, and leaving the thyrostomes and dorsal surface of the ooecia much depressed.

Schizoporella chlithridiata, n. sp. (Pl. VIII., Fig. 13).

Zooecia oval, distal extremity overlapping; surface faintly ribbed horizontally, the centre portion below the thyrostome raised into a long smooth process; on the rest of the surface are a few small scattered pores or minute papillae. Thyrostome arched above, broad curved sinus in lower lip. Avicularia vicarious, with well-defined pores in more or less regular rows; mandibular cavity chlithridiate. Ooecia subglobose, immersed, with a longitudinal umbo.

Locality.—Clifton Bank, Muddy Creek (T. S. Hall).

A colony on a small bivalve shell. The great peculiarity of this species is the vicarious avicularium and its chlithridiate mandibular cavity. The ooecia are generally more produced distally into a prominent umbo than the one figured, but the portion illustrated was chosen as it shows three of the avicularia.

Schizoporella ambigua, n. sp. (Pl. VIII., Fig. 14).

Zooecia large, hexagonal; margins raised; surface covered with large perforations. Thyrostome arched above; lower margin with a very wide shallow sinus. Ooecia large, globose, slightly immersed, perforated; with a large acute avicularium, on the distal part on one side, with the mandible pointing proximally.

Locality.—Mitchell River (J. Dennant).

This is a very striking species, as it has avicularia on the ooecia. On one zooecium there is on one side of the thyrostome a hemispherical avicularium, with a semicircular mandibular opening. The thyrostome has a very wide shallow sinus, and on this account I think this species should, with others having similar thyrostomes, be relegated to a new genus, as they differ so much from the typical forms with a narrow sinus.

Gemellipora auriculata, n. sp (Pl. VIII., Fig. 15).

Zooecia oval, ventricose. Thyrostome longer than broad, with a deep, pointed triangular sinus on the proximal margin. A comparatively large ear-shaped raised avicularium on one side of the zooecia.

Locality.—Mitchell River (J. Dennant).

This is near *G. elegantissima*, McG., but the avicularia are much larger, and the surface of the zooecia is smooth, not perforated. The avicularia are sometimes absent, and on one (broken) zooecium on another specimen there are two avicularia (Fig. 15*a*).

Aspidostoma airensis, n. sp. (Pl. VIII., Fig. 16, 16*a*).

Zoarium robust, in vincularia form. Zooecia very large, elongate, produced beyond the thyrostome as a more or less acute, concave process; a small acute avicularium on one side of the zooecia. Thyrostome arched above; proximal margin with a very broad projecting lip, leaving a narrow opening or sinus at each lower angle. Ooecia globose, with a large flat area in front surrounded by a narrow ridge.

Locality.—Aire Coastal Beds (T. S. Hall).

This is a very large celled species, the acute distal prolongation of the zooecia is very characteristic. On the zooecium which bears an ooecium the concave prolongation is represented by a long round rough spine on the side of the thyrostome. The surface of the proximal margin of the zooecia is slightly turned up in very regular small square crenulations—an ornamentation of a character I have not before seen in polyzoa. I have some fragments from Cape Otway in which the zoarium has zooecia on one side only, and they are not produced distally into a point, although they protrude somewhat; they are probably imperfect specimens of this species.

Cellaria incudifera, n. sp. (Pl. IX., Fig. 17, 17*a*).

Zoarium large, cylindrical. The zooecia vary in shape. In the ordinary zoarial form some are battledore-shape, some diamond-shape; but in the stouter zoaria they are elongated hexagonal with distal and proximal margins horizontal; all have

raised borders. Thyrostome oval, or subquadrate, higher than wide, with an anvil-shaped process growing in a proximal direction from the distal margin.

Locality.—Spring Creek (T. S. Hall).

This species is at once recognised by the peculiar anvil-shaped process projecting from the distal end over the thyrostome. In the larger form, with the hexagonal zooecia, there is a very large opening above the thyrostome; these openings are probably ovarian pores of a similar character as, but much larger than, those of *C. cucullata*, McG., their occurrence on the larger form only supports this opinion.

Fig. 17*b* is an end view of an internode showing three pores through which the chitinous connecting cords passed.

Cellaria robusta, n. sp. (Pl. IX., Fig. 18).

Zoarium robust. Zooecia large and broad, somewhat diamond-shaped or hexagonal with angles at distal and proximal ends; margins raised and curved so that the sides often do not show any lateral angles. Thyrostome suborbicular with two small denticles projecting from the proximal margin, and a plate showing two small denticles projecting from the distal margin. Avicularian cell with aperture arched above; lower margin incurved.

Locality.—Spring Creek (T. S. Hall).

Of this species I have found only a few small fragments. The avicularian cell has an opening very little larger than the thyrostome of the zooecia, and might be mistaken for one, but it has no denticles, and has an incurved lower margin; there is a small hemispherical umbo above it.

Micropora carinata, Maplestone. (Pl. IX., Fig. 19).

This species was described by me in my last paper.[1] I have since found a specimen bearing ooecia, which I now figure. They are large, globose, broader towards the distal end; smooth, with four small clefts on the distal border.

Locality.—Mitchell River (J. Dennant).

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1 Proc. Roy. Soc. Vic., vol. xiii., pt. ii., p. 207.

? Lepralia bisinuata, n. sp. (Pl. IX., Fig. 20).

Zooecia quadrate, flat, with a row of large pores round the margin which is narrow and slightly raised. Thyrostome horse-shoe-shaped with a projection on each side near the lower margin, the centre of which is incurved, forming a sinus in each lower angle. A small oval avicularium, with a bar, below the thyrostome.

Locality.—Mitchell River (J. Dennant).

A single specimen. In two of the zooecia figured the avicularium is perfect, in one it is only partly developed, and in the fourth it is absent. This I at first supposed to be a Smittia near S. reticulata; on further examination the form of the thyrostome, as shown on a larger scale in Fig. 20*a*, was found to be Lepralian of a type similar to L. cleidostoma, Smitt., but the inward curvature of the lower or proximal margin forming a sinus in each corner is peculiar, it simulates the "lyrula" found in most of the Smittiae, but that is always internal or below the level of the thyrostome, this is part of the margin itself, it may require a new genus for its reception near Smittia, distinguished therefrom by the double sinus.

Trypocella, nov. gen.

Zooecia elongate, flat. Thyrostome orbicular, with an acute sinus in the proximal margin formed by the incomplete junction of the cell wall. No peristome.

Trypocella excavata, n. sp. (Pl. IX., Fig. 21).

Zooecia elongate, irregularly hexagonal, with a row of large pores round the margin. Central portion concave. Thyrostome orbicular with a very acute sinus. A large circular pore on each side a little below the thyrostome.

Dorsal surface with large pores.

Locality.—Spring Creek (T. S. Hall).

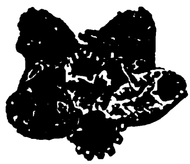
A single specimen in good preservation. I cannot assign this species to any of the existing genera of the Escharine group on account of the very peculiar structure of the thyrostome, which is without any raised margin or peristome; it appears as though

the calcification of the front wall of the cell proceeded from the margins to the centre and did not quite coalesce at the centre of the proximal margin of the thyrostome forming the sinus, and the depressed area below it may be owing to a low degree of calcification. The two large circular pores below the thyrostome are very conspicuous, and probably are either avicularian or vibracularian.

EXPLANATION OF PLATES VI., VII. AND VIII.

1.—Schizoporella nitidissima, n. sp.
2.—S. vigilans (ooecia), Waters.
3.—S. terebrata, n. sp.
4.—S. convexa, M'G. (ooecia).
5.—S. ovalis, n. sp.
6.—S. mamillata, n. sp.
7.—S. pulvinata, n. sp.
8.—S. hispida, n. sp.
9.—S. subgranulata, n. sp.
10.—S. flabellata, n. sp. (zoarium). *a.* zooecia.
11.—S. fenestrata, Waters.
12.—S. varabilis, n. sp. *a.* ooecia.
13.—S. chlithridiata, n. sp.
14.—S. ambigua, n. sp.
15.—Gemellipora auriculata, n. sp.
16.—Aspidostoma airensis, n. sp. *a.* ooecium.
17.—Cellaria incudifera. n. sp. *a.* hexagonal zooecia. *b.* end of zoarium.
18.—Cellaria robusta, n. sp.
19.—Micropora carinata, Maplestone (ooecium).
20.—? Lepralia bisinuata, n. sp. *a.* outline of thyrostome.
21.—Trypocella excavata, n. g. et. n. sp.

All Figures × 25.



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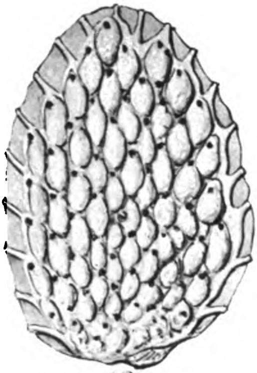

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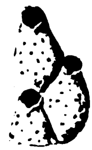

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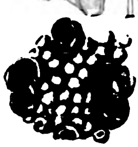

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Art. VIII.—*A Suggested Nomenclature for the Marine Tertiary Deposits of Southern Australia.*

By T. S. HALL, M.A., and G. B. PRITCHARD.

[Read 10th October, 1901.]

The confusion that has existed and still exists as to the age of the various members of the Tertiary series of Southern Australia makes it impossible for anyone who is not familiar with the history of the subject to understand what beds are referred to when the terms Eocene, Miocene, or Pliocene are used. It will probably be long before complete unanimity exists among workers in various parts of the globe as to the ages to which our subdivisions are to be referred, and meanwhile fossils are being described and recorded as Eocene or Miocene and the confusion is rapidly becoming worse. Moreover, with the progress of time the ideas of authors as to the age of certain beds change and their Eocene of to-day is not their Eocene of say ten years ago.

One familiar with even the outlines alone of our Tertiary Geology has only to glance at the brief notices which modern English text books give of our Cainozoic series to see confusion in the minds of geologists elsewhere. The fault lies at our own door and we should amend our ways and not pillory those who cannot understand us. We ourselves know without any difficulty what Duncan meant when he said "Miocene" and what M'Coy meant by Oligocene. We know what beds Professor Tate, Mr. Dennant and ourselves mean by these terms, but it is surely too much to ask anyone to so familiarize himself with the kaleidoscopic changes of our Tertiary controversy that he has to recollect the date of the paper he is reading and the particular views of the author at that date in order to remember the fauna associated with a newly described fossil.

Perhaps two examples will show the condition into which we have drifted and the urgent need of reform. There is a short section exposed near the hamlet of Beaumaris on the shores of Port Phillip Bay which, before closer settlement had filled in our

maps with locality names, was referred to as the Mordialloc, Cheltenham or Brighton beds. The age to which the beds are to be referred is the subject of very diverse views, as the following statement will show.

They were referred to :—

Older Pliocene -	by McCoy - - - -	1875
Miocene - - -	by Hall and Pritchard -	1897
Miocene (?) - -	by Tate - - - - -	1888
Oligocene (?) - -	by Tate - - - - -	1899
Eocene - - -	by Tate and Dennant -	1893
Eocene - - -	by Pritchard - - -	1892

Similarly a series of beds at Spring Creek, south of Geelong, was held by M'Coy to range from Upper Miocene to Oligocene. Messrs. Tate and Dennant at one time considered the whole series Eocene, but at a later date Professor Tate referred it to Oligocene, while we are of opinion that the series as a whole is older than the Mornington series called Eocene by Messrs. Tate and Dennant as well as by ourselves.

Correlation of Australian strata with those of the Old World and with America is a task of great importance, and problems of interest connected with the place of origin of certain forms of life can only be solved when this task shall have been fulfilled. Hitherto the question of correlation has not received very detailed investigation at the hands of geologists of the northern hemisphere, for the question is one of extreme difficulty. The conclusions of Australian geologists have been provisionally accepted with a more or less open expression of doubt. But the time for this is passing away and we shall no longer be allowed to settle the question alone as best we can. American geologists are turning their attention to the Patagonian Tertiaries, which they assert have, as we should expect, an undoubted close relationship to ours. By the time scale they deduce they will judge the age of the mammalian fauna there, and as far as has yet been announced they will refer the marine beds to a younger age than we do. Probably if this be so we shall not give way without a struggle, but, with our present nomenclature, we must use terms which imply the acceptance of a theory. As a great amount of work for many years to come will be concerned with

the local correlation of our beds and the elaboration of our subdivisions it seems to us advisable to employ local names for the main subdivisions of our strata. This plan is of world-wide use, and by its adoption we should be making no retrograde step, but would be clearing the way for a detailed consideration of two problems, namely the correlations of our strata between themselves, and a correlation with strata elsewhere. If the main types have these names applied to them there will no longer be any need to say whose views one is following, as we need to now when speaking of certain beds as Eocene or Miocene. The important question as to the relative position of the different formations can be put on one side and need not be forced into consideration in every line of a paper dealing with some small local set of strata.

Recognising then the advisability of such a change, it remains to consider what are the principles which should actuate us in our choice. These seem to be few and simple. Firstly, any series of strata with a fauna differing appreciably in its constituents from others should receive a distinctive name. Secondly, the name should be taken from a locality where there is no chance of confusion between the contents of beds of distinct ages. Thirdly, we should not use names which are used in other parts of the world as names of formations. In the fourth place, it should be understood that the names given are given to a particular set of strata and are irrespective of the correctness or otherwise of the subsequent correlation of other beds with them.

Bearing these provisos in mind we may consider their application to our Tertiary strata and discuss the appropriateness of the following names which we suggest.

Werrikooian.

The Limestone Creek beds on the Glenelg River are in the Parish of Werrikoo, in the County of Follett. They have been referred to Pleistocene and to Pliocene. There is another Limestone Creek, near the head of the Murray, in Victoria, which yields Palaeozoic fossils, and a third in the County of Heytesbury, with Older Tertiary fossils.

Kalimnan.

The beds at Jimmy's Point, near the mouth of the Gippsland Lakes, are near the township of Kalimna. They were referred to Older Pliocene by Sir F. M'Coy, and by Mr. Dennant to Miocene. There are two other deposits in Victoria with rich faunas, which were considered Older Pliocene by M'Coy, namely, the Upper beds at Muddy Creek, near Hamilton, and the Beaumaris beds.

The former is called Miocene by Messrs. Tate and Dennant and ourselves, but, as it immediately overlies beds belonging to our older Tertiary series, a name received from this locality is unsuitable. The Beaumaris beds, again, are considered by ourselves to belong to the same series, but are quoted as older by Professor Tate, so that they are out of court.

Balcombian.

The clays and limestones of Balcombe's Bay contain another distinct fauna. The beds are sometimes spoken of as at Mornington, but the locality we give is more exact. The Lower Beds at Muddy Creek and the Orphanage Hill beds at Fyansford, near Geelong, are approximately equivalent to the Balcombe's Bay Beds, but the exact separation of the two sets of beds at Muddy Creek is not yet sufficiently clear, and a name from that locality would lead to confusion. The beds are called Eocene by Messrs. Tate and Dennant and ourselves. Sir F. M'Coy considered them Oligocene.

Jan Jucian.[1]

The section near Spring Creek, on the coast of Bass Strait, south of Geelong, is in the main in the Parish of Jan Juc, and its fauna differs greatly from that of Balcombe's Bay. The confusion about the age of these beds has been referred to above. The township near Spring Creek is called Torquay, but the use of this name in England renders another advisable. The older name for Torquay was Puebla, but the employment of this name, again, would lead to confusion with certain American strata.

1 The "c" is sounded like "k."

The name Jan Juc remains, and is referred to by M'Coy as the locality whence several of his fossils came.

Aldingan.

The term Aldingian has been used by Professor Tate in speaking of the section at Aldinga, but we should prefer the spelling we give. In the cliff sections, as described by Messrs. Tate and Dennant, "Miocene" overlies "Eocene," and the term Aldingian as used by them includes both sets of strata. If it be confined to the lower series only, it might perhaps be employed, though it violates the principle that a name should not be given from a locality where two distinct series are in contact. As we differ from the views of Messrs. Tate and Dennant on the question as to its equivalence or otherwise with the Spring Creek series, a type name may be thought advisable, for the present at any rate, though our own views are opposed to its use.

We should like once more to emphasise the point that the names we give are given in the first place to the beds displayed at the localities from which the names are derived, and we are thus able to fix a top and a bottom to each formation. There can be no doubt, except in our opinion in the case of Aldingan and Jan Jucian, of the distinctness of the faunas they typify.

CORRELATION.

We now come to consider the different sets of beds to be ranged under these names, for series of strata agreeing palæontologically must be grouped with them. About some there is at present unanimity of opinion, but in other cases diverse views are held. These points we shall indicate as far as we can, though, owing to the fact that no very detailed lists of comparable localities have been published by Messrs. Tate and Dennant, it is possible that their views may not always be correctly represented. The list we give is practically that published by one of us (G. B. P.) in the Report of the Brisbane Meeting of the Australasian Association for the Advancement of Science in 1895.

Werrikooian.

Limestone Creek.

Kalimnan.

Jimmy's Point, Gippsland. Upper beds of the Murray River Cliffs. Upper beds at Aldinga. Upper beds at Muddy Creek. Upper beds at Shelford. With these we would associate the Marine Sands of the Dry Creek and Croydon bores, South Australia, which were regarded by Prof. Tate as intermediate in age between the Limestone Creek and the Jimmy's Point beds. To this series we also refer the Upper beds at Beaumaris, which were correlated by Professor Tate with the Spring Creek series, the latter being, in our opinion, older than Balcombian.

Balcombian.

Balcombe's Bay and Grice's Creek, Mornington. Lake Connewarre. Southern Moorabool Valley. Upper beds at Maude. Altona Bay. Gellibrand. Camperdown. Murgheboluc. Shelford, lower beds. Bairnsdale. Corio Bay. Curlewis. Belmont. Fishing Point, Aire River.

Jan Jucian.

Spring Creek. Table Cape, Tasmania. Waurn Ponds. With these we include the lower beds at Maude, which Professor Tate and Mr. Dennant considered to show much closer relationship to the lower beds of Muddy Creek. We also refer to the same series the lower (*i.e.* "Eocene") beds at Aldinga, the Aire Coastal series and the Cape Otway beds. In the association of the Aldinga, Aire Coastal and Cape Otway beds together we are apparently in agreement with the views of Messrs. Tate and Dennant, but, as will be seen on referring to the earliest parts of this paper, their association with the Spring Creek and Table Cape series is strongly opposed to the view of the same authors. But as has been already pointed out the correctness of all the details of this correlation is not a necessary preliminary to the use of the terms suggested. It is open to those who differ to separate any of the members, and, where possible, to group them similarly under other appropriate names.

There still remains a number of localities which we have not grouped with any of the formations. With regard to these we consider the published evidence or our own knowledge to be insufficient for the expression of a definite opinion.

THE SEQUENCE AND AGE.

As an addendum to the main part of this note we may as well consider the different views which have existed as to the sequence and age of the beds to which we have attached names.

	M'Coy.	Tate & Dennant.	Hall & Pritchard.
Werrikooian	—	Pleistocene (Tate) Pliocene (Dennant)	Pliocene
Kalimnan	Older Pliocene	Miocene	Miocene
Balcombian	Oligocene	Eocene	Eocene
Jan Jucian	Miocene to Oligocene	Oligocene (?) (Tate) Eocene	Eocene
Aldingan	—	Eocene (in part)	Eocene (in part)

We thus have not only differences of opinion as to the ages of the beds but also as to the sequence of the component formations.

To put the matter in another way, the sequence according to the various authors would be—in descending order.

M'Coy.	Tate & Dennant.	Hall & Pritchard.
—	Werrikooian	Werrikooian
Kalimnan	Kalimnan	Kalimnan
Jan Jucian	Jan Jucian	Balcombian
Balcombian	Balcombian	Jan Jucian and Aldingan (in part)
	Aldingan (in part)	

Art. IX.—*Newer Pliocene Strata on the Moorabool River.*

By J. F. MULDER.

(Communicated by J. Dennant, F.G.S., F.C.S.).

[Read 10th October, 1901.]

A paper read by Messrs. Hall and Pritchard in June, 1897, before this Society, was the cause of several excursions to the Moorabool River, in the neighbourhood of the Viaduct, by members of the Geelong Field Naturalists' Club, the object being to find the Miocene outcrop therein described. The search, as we afterwards found, was on the wrong side of the river, but on the opposite, or eastern bank, a new fossil bed was discovered, which is so interesting that I have asked permission to bring it under the notice of the Royal Society. This deposit consists of a layer of sandy gravel, about 20 feet thick, directly underlying the basalt which tops the hills on both sides of the river. The gravel bed is nearly on a level with the Viaduct, and is full of calcareous casts of fossils. In the light of Mr. Pritchard's identifications of the fossil casts in the ironstone near at hand, we at first thought the deposit to be a Miocene one, but, as will be shewn presently, this is not the case. To prove definitely whether the shells lie actually under the basalt, or simply rest against it on the side of the hill, we followed the river up for about 40 chains until we came to a road running at right angles to the river as well as to the above-mentioned deposit higher up the bank. This road leads right up to the basaltic plain, and, in following it from the river, we first came to rotten limestone with a few fragments of Eocene shells (the basal bed), and on climbing still higher we encountered the continuation of the same gravel bed, with calcareous casts of shells, as that previously mentioned, and with basalt also resting upon it. I obtained photographs of these two sections and shewed them to Mr. T. S.

Hall, who at once said that they represented a new bed and not the one he and Mr. Pritchard had described, which is on the west side of the river. The shell casts were submitted to Mr. Dennant last year, who said that they appeared to consist of living species rather than of those proper to the Miocene, and recommended me to send them to Professor Tate for definite determination. This was done, and, with his usual good nature, the Professor, whose recent death must be deplored by all of us, wrote to me at some length upon the material forwarded. I give Professor Tate's remarks in his own words:—"The majority of the mollusca are in the state of pseudomorphs after calcite, and the fine ornament in the majority of cases is obliterated; this renders critical comparison hardly possible. At a first glance it seemed that the collection might belong to any period, from Miocene to Recent. However, selecting the species shewing the most determinate characters, I proceeded to ascertain their species names, and, after comparison with related species, recent and fossil, I arrived at the conclusion that I had essentially a modern fauna to deal with. This gave me a clue to the determination of the obscure forms, though in their case, as with the others, all available sources of comparison were utilised. The result is that of 13 species, to which approved names have been given,[1] 12 are recent species, and are to be found as cast-up shells on the beaches of Southern Australia. The extinct species is Pecten antiaustralis, which, however, extends from its commoner habitat of Miocene to Older Pliocene; it is one of the very few which pass up from the Older Tertiary to just within touch of the Recent.

In conclusion, (1) The faunula is essentially recent, and, though one out of thirteen is not actually known living, it would be misleading to apply the percentage test on such low figures as an index to age, and it is not improbable that, if the list were extended to a hundred, 99 per cent. would be recent. The deposit is synchronous with that of Limestone Creek described by Mr. Dennant, and if from that faunula we subtract the species

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1 Four others were subsequently named by Professor Tate, and the list now contains 17 named species.

of extraneous origin the general results are identical. The time horizon may be indicated by Older Pleistocene.[1]

(2) The faunula belongs to shallow water, not absolutely littoral, but the depth indicated by the species was not beyond the influence of wave disturbance in rough weather.

(3) The mineralization of the fossils must not be regarded as evidence of greater antiquity than the corresponding deposit at Limestone Creek, wherein the tests are unaltered."

Professor Tate's determinations are the following:—

Purpura textiliosa, Lam.
Siphonalia tasmaniensis, Adams and Angas
Nassa lyrella, Beck
Nassa fasciata, Lam.
Batillaria cerithium, Quoy
Turritella clathrata, Kiener
Natica plumbea, Lam.
Risella plana, Quoy
Ostrea angasi, Sow.
Ostrea mordax, Gould
Pecten antiaustralis, Tate
Mytilus magellanicus, Lam. (?)
Mytilus planulatus, Lam.
Meretrix alatus, Reeve
Corbula scaphoides, Hinds
Barnea australasiae, Sow.
Teredo tube.
Magellania flavescens, Lam.
Balanus, sp.

A very important conclusion follows from the fossil evidence here produced, namely, that the age of the superincumbent basalt is brought still nearer to our own times; it cannot be older than Newer Pliocene, and may even be Pleistocene.

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1 The Limestone Creek beds are by Mr. Dennant assigned to the Newer Pliocene, the extraneous origin of some shells in the deposit being, he says, a surmise only, and not demonstrable from an examination of the sections. Following him, I call the Moorabool bed Newer Pliocene.

Art. X.—*Catalogue of the Marine Shells of Victoria.*

Part V.

By G. B. PRITCHARD and J. H. GATLIFF.

[Read 14th November, 1901].

The present paper refers to one hundred and thirty two species contained in the following families:—Cerithiidae (in part), Planaxidae, Litiopidae, Littorinidae, Neritidae, Liotiidae, Cyclostrematidae, Rissoidae, Turbinidae, and Trochidae. The previous papers, Parts I. to IV., dealt with 287 species, so that, with this part, the total number of species now dealt with amounts to 419.

We would take this opportunity of drawing attention to a very useful and valuable paper just published in the July number of this year of the Proceedings of the Malacological Society of London by C. Davies Sherborn, F.Z.S., and B. B. Woodward, F.L.S., on the dates of publication of Kiener's "Species General," etc. We have long felt the want of this piece of work, and are heartily thankful to the authors for their labours. We think it would also be a very good thing if the same reliable workers could be persuaded to undertake a similar task for the different parts of Philippi's Conchylien Cabinet. As an instance of the trouble with this work we might indicate the genus Trochus, which, in the bound copy in the Public Library, Melbourne, is dated on the title page 1846, but some of the parts were evidently later than this, as references are included for descriptions in Zeits. f. Malak., 1848; again, in the case of Trochus ochroleucus there is only the date of the title page as above indicated, but Tryon states the date as after 1853. It seems pretty evident that the paper covers on the separate parts as issued should have been bound up with the parts, in order to preserve the dates of issue, and where this has not been done, trouble has naturally arisen.

For the range of many of our Victorian species along the New South Wales coast, Mr. Hedley's valuable contributions entitled

"Studies on Australian Mollusca," now appearing in the Proceedings of the Linnaean Society of New South Wales, should be consulted.

Family Cerithiidae.

Genus Triforis, Deshayes, em. 1824 (Triphoris).

Triforis angasi, Crosse and Fischer.

1865. Triphoris angasi, Crosse and Fischer. Jour. d. Conch., p. 46, pl. 1, f. 12, 13.
1873. Cerithium minimus, Hutton. Cat. N.Z. Moll., p. 27.
1880. Triphoris angasi, Hutton. N.Z. Moll., p. 75.
1887. Triforis angasi, Tryon. Man. Conch., vol. ix., p. 179, pl. 37, f. 93.

Hab.—Coast generally.

Obs.—This is the commonest of our species, and tends to show some variation in its colour markings.

Triforis pfeifferi, Crosse and Fischer.

1865. Triphoris pfeifferi, Crosse and Fischer. Jour. d. Conch., p. 47, pl. 1, f. 14, 15.
1887. Triforis pfeifferi, Tryon. Man. Conch., vol. ix., p. 182, pl. 38, f. 9.

Hab.—Western Port; Sorrento; Puebla Coast.

Triforis fasciatus, T. Woods.

1879. Triforis fasciata, T. Woods. P.R.S. Tas., p. 34.
1887. Triforis fasciatus, Tryon. Man. Conch., vol. ix., p. 190.

Hab.—Western Port.

Triforis tasmanica, T. Woods.

1876. Triforis Tasmanica, T. Woods. P.R.S. Tas., p. 28.
1887. Triforis tasmanica, Tryon. Man. Conch., vol. ix., p. 184, pl. 38, f. 31.

Hab.—Western Port; Sorrento; Puebla coast.

Note.—We have at least six other species of this genus as yet undetermined.

Family PLANAXIDAE.

Genus **Planaxis**, Lamarck, 1822.

PLANAXIS MOLLIS, Sowerby.

1822. Planaxis mollis, Sowerby. Gen. of Shells, vol. ii., pl. 219, f. 2.
1822. Buccinum brazilianum, Lamarck. Anim. S. Vert., vol. vii., p. 272.
1828. Buccinum laevigatum, Wood. Index Test. sup., p. 13, pl. 4, f. 29*a*.
1839. Planaxis mollis, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 585, No. 6.
1842. Planaxis mollis, Reeve. Conch. Syst., vol. ii., p. 238, pl. 270, f. 2.
1850. Planaxis pigra, Forbes. P.Z.S. Lond., p. 273, pl. xi., f. 5.
1851. Planaxis fulva, A. Adams. P.Z.S. Lond., p. 271.
1876. Planaxis brasilianus, Reeve. Conch. Icon., vol. xx., pl. 5, f. 35.
1887. Planaxis (Hinea) mollis, Tryon. Man. Conch., vol. ix., p. 279, pl. 52, f. 34, 35.

Hab.—Otway Coast, between Ryan's Den and Moonlight Head (Mr. P. J. Fulton).

Family LITIOPIDAE.

Genus **Diala**, A. Adams, 1861.

DIALA MONILE, A. Adams.

1862. Alaba monile, A. Adams. A.M.N.H., vol. x., 3rd ser., p. 296, No. 17.
1875. Diala tesselata, T. Woods. P.R.S. Tas., p. 147.
1887. Diala monile, Brazier. T.R.S. S.A., vol. ix., p. 122.
1887. Litiopa (Diala) monile, Tryon. Man. Conch., vol. ix., p. 283.

Hab.—Common in Port Phillip, particularly along the western shores; enormous numbers to be obtained at Port-

arlington, Outer Geelong Harbour, Corio Bay, and Altona Bay. Also from Western Port. Portland (Maplestone).

Obs.—The type of this species was originally obtained from Port Lincoln, South Australia. Professor Tate states that the types are immature and that D. tesselata, T. Woods, better exemplifies the species than the commoner form in South Australian waters.

DIALA LAUTA, A. Adams.

1862. Diala lauta, A. Adams. A.M.N.H., vol. x., 3rd ser., p. 298, No. 5.

1875. Diala punctata, T. Woods. P.R.S. Tas., pp. 147, 148.

1887. Diala lauta, Brazier. T.R.S. S.A., vol. ix., p. 122.

1887. Litiopa (Diala) lauta, Tryon. Man. Conch., vol. ix., p. 282, pl. 53, f. 83.

Hab.—A common associate with the previous species, especially in Port Phillip and Western Port.

Obs.—The type of this species originally came from Port Adelaide. It is somewhat variable in dimensions and in the depth of the suture.

DIALA PHASIANELLA, Angas.

1867. Alaba phasianella, Angas. P.Z.S. Lond., p. 113, pl. 13, f. 18.

1886. Alaba (Diala) phasianella, Watson. Chall. Zool., vol. xv., p. 567.

1887. Litiopa (Diala) phasianella, Tryon. Man. Conch., vol. ix., p. 283, pl. 53, f. 84.

Hab.—Western Port.

Obs.—This may only be a thin delicate form of Diala monile, it is a form which we usually obtain in Western Port, where the muddy nature of its habitat may possibly account for its variations, as against the stout robust forms from the more sandy parts of Port Phillip.

DIALA MAGNA, Tate.

1891. Diala magna, Tate. T.R.S. S.A., vol. xiv., pt. ii., p. 259, pl. 11, f. 9.

Hab.—Deep water, Port Phillip Bay (J. B. Wilson).

Obs.—Professor Tate states that this species is at once distinguished by its size, its furrowed suture, and the flat distant ribs on the base, at the same time he notes that its nearest ally is Diala lauta, A. Adams. We must remark that for our own part we feel somewhat dubious about the validity of this species, and are somewhat inclined to regard it as an exceptionally large specimen of Diala lauta.

DIALA PAGODULA, A. Adams.

1862. Alaba pagodula, A. Adams. A.M.N.H., vol x., 3rd ser., p. 297.

1887. Litiopa (Alaba) pagodula, Tryon. Man. Conch., vol. ix., p. 282.

Hab.—Common in Port Phillip.

Obs.—Rissoina St. Clarae, Tenison Woods, P.R.S. Tas., 1877, p. 154, No. 67, is, we think, from the description, the above species; it most certainly is a Diala.

DIALA PULCHRA, A. Adams.

1862. Alaba pulchra, A. Adams. A.M.N.H., vol. x., 3rd ser., p. 296, No. 15.

1887. Litiopa pulchra, Tryon. Man. Conch., vol. ix., p. 282.

Hab.—Port Phillip; Western Port.

Obs.—The type of this species is recorded as from Port Adelaide, and is noted as being a handsomely painted species with the whorls nodosely plicate at the sutures. We have shells which apparently represent this species, but we are much inclined to think it is only a form of D. pagodula, A. Adams, examples of which we have strongly nodosely plicate, at the sutures, faintly nodosely plicate, and some, which appear evidently the same in all other respects entirely without any nodosities.

DIALA VARIA, A. Adams.

1861. Diala varia, A. Adams. A.M.N.H., vol. viii., 3rd ser., p. 243.

1887. Litiopa varia, Tryon. Man. Conch., vol. ix., p. 282.

Hab.—Western Port; Puebla Coast.

Obs.—This species is run into Alaba semistriata, Philippi, by Tryon, but we are not satisfied that this is correct. The shell we have as representing the above species appears closely related to D. lauta, A. Adams, but is usually a thin translucent dark coloured and smaller form, and may, as a rule, be picked out from small examples of D. lauta. In the original description it is recorded as not uncommon in the Korea and Japan.

Family Littorinidae.

Genus Littorina, Férussae, 1821.

Littorina mauritiana, Lamarck.

1822. Phasianella mauritiana, Lamarck. Anim. S. Vert., vol. vii., p. 51.
1827. Litorina unifasciata, Gray. King's Survey of Australia, vol. ii., App. p. 483.
1833. Littorina diemenensis, Quoy and Gaimard. Astrolabe, vol. ii., p. 479, pl. 33, f. 8-11.
1839. Phasianella mauritiana, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 587, No. 9.
1841. Phasianella mauritiana, Delessert. Recueil de Coquilles décrites par Lamarck, pl. 37, f. 14.
1843. Phasianella mauritiana, Lamarck. Anim. S. Vert. (ed. Desh.), vol. ix, p. 244, No. 9.
1843. Litorina acuta, Menke. Moll. Nov. Holl., p. 9, No. 24.
1857. Littorina unifasciata, Reeve. Conch. Icon., vol. x., pl. 17, f. 100.
1857. Littorina laevis, Reeve (non Philippi). *Id.*, pl. 17, f. 95.
1857. Littorina africana, Reeve (non Philippi). *Id.*, pl. 8, f. 37.
1865. Littorina unifasciata, Angas. S.A. Moll., P.Z.S. Lond., p. 172, No. 101.
1867. Littorina unifasciata, Angas. Port Jackson Moll., P.Z.S. Lond., p. 209, No. 139.
1873. Littorina diemenensis, Hutton. Cat. N.Z. Moll., p. 27.

1878. Littorina unifasciata, T. Woods. P.R.S. Tas., 1877, p. 36.

1880. Littorina caerulescens, Hutton (non Lamarck). N.Z. Moll., p. 79.

1882. Litorina unifasciata, Weinkauff. Conch. Cab. (ed. Küster), p. 97, sp. 111, pl. 14, f. 4.

1882. Litorina diemensis, Weinkauff. Conch. Cab. (ed. Küster), p. 18, pl. 2, f. 23, 24.

1884. Litorina unifasciata, E. A. Smith. Alert Zool., p. 60, No. 62.

1886. Litorina mauritiana, Watson. Chall. Zool., vol. xv., p. 574, No. 2.

1887. Littorina mauritiana, Tryon. Man. Conch., vol. ix., p. 247, pl. 44, f. 71, 72, 73, and 75 (non 70 and 74).

1887. Littorina unifasciata, Tryon. *Id.*, p. 247.

Hab.—Coast generally, very common on the rocks at and above high water mark.

LITTORINA NOVAEZEALANDIAE, Reeve.

1857. Littorina novaezealandiae, Reeve. Conch. Icon., vol. x., pl. 14, f. 74.

1873. Littorina novaezealandiae, Hutton. Cat. N.Z. Moll., p. 28.

1880. Littorina novaezealandiae, Hutton. Man. N.Z. Moll., p. 79.

1887. Littorina novaezealandiae, Tryon. Man. Conch., vol. ix., p. 249, pl. 47, f. 76 (non f. 77).

Hab.—Coast generally. Particularly fine examples to be obtained along the Back Beach, Williamstown.

Obs.—This appears undoubtedly to be the name that should be applied to our species, though many mis-identifications have been already made on this form L undulata, T. Woods (non Gray), in the Tasmanian List for 1877, is probably the same as the above. In Mr. Gatliff's List of Victorian Mollusca published in the Victorian Naturalist, 1887, this same species is recorded as L. philippi, Carpenter, on the identification of Mr. Brazier; and in a recent List of Tasmanian Shells by Miss M. Lodder we also note the record of L. philippi, Carpenter.

LITTORINA PALUDINELLA, Reeve.

1857. Littorina paludinella, Reeve. Conch. Icon., pl. 16, f. 84.

1878. Littorina paludinella, T. Woods. P.R.S. Tas., for 1877, p. 36.

1887. Littorina paludinella, Tryon. Man. Conch., vol. ix., p. 255, pl. 46, f. 36.

Hab.—Port Phillip; Back Beach, Sorrento; Puebla Coast; C. Otway.

Note.—There are two other small species of this genus represented, but, as yet, we have been unable to identify them.

Genus **Risella**, Gray, 1840.

RISELLA MELANOSTOMA, Gmelin.

1781. Trochus in fauce nigerrimus, Chemnitz. Conch. Cab., vol. v., pl. 161, f. 1526 *a*, *b*.

1789. Trochus melanostomus, Gmelin. Syst. Nat., p. 3581, No. 90.

1822. Trochus nanus, Lamarck. Anim. S. Vert., vol. vii., p. , No. 67.

1834. Trochus auratus, Quoy and Gaimard. Astrolabe, vol. iii., p. 276, pl. 62, f. 15-19.

1834. Trochus nanus, Quoy and Gaimard. *Id.*, p. 273, pl. 62, f. 5-7.

1834. Trochus planus, Quoy and Gaimard. *Id.*, p. 274, pl. 62, f. 13, 14.

1834. Trochus luteus, Quoy and Gaimard. *Id.*, p. 271, pl. 62, f. 8-11.

1839. Trochus nanus, Lamarck. Anim. S. Vert., (3rd ed. Deshayes and Edwards), vol. iii., p. 555.

1839. Trochus melanostomus, Lamarck. *Id.*, p. 557.

1839. Littorina australis, Gray. Beechey's Voy. Zool., p. 141.

1841. Trochus nanus, Delessert. Recueil de Coquilles décrites par Lamarck, No. 67, pl. 36, f. 3 *a*, *b*, *c*.

1843. Trochus nanus, Lamarck. Anim. S. Vert. (ed. Deshayes), vol. ix., p. 150.

1843. Trochus melanostomus, Lamarck. *Id.*, p. 157.

1846. Bembicium melanostomum, Philippi. Zeits. f. malak., p. 130.
1846. Bembicium nanum, Philippi. *Id.*, p. 131.
1846. Bembicium pictum, Philippi. *Id.*, p. 132.
1846. Bembicium planum, Philippi. *Id.*, p. 131.
1846. Bembicium vittatum, Philippi. *Id.*, p. 131.
1858. Risella lutea, H. and A. Adams. Genera, vol. i., p. 318, pl. 33, f. 5.
1858. Risella melanostoma, H. and A. Adams. *Id.*, p. 318, pl. 33, f. 5*c*.
1858. Risella nana, H. and A. Adams. *Id.*, p. 318.
1858. Risella plana, H. and A. Adams. *Id.*, p. 318.
1858. Risella vittata, H. and A. Adams. *Id.*, p. 318.
1860. Risella nana, Chenu. Man. de Conch., vol. i., p. 302.
1864. Risella melanostoma, Crosse. Jour. de Conch., p. 229, pl. xi., f. 1.
1864. Risella aurata, Crosse. *Id.*, p. 233.
1864. Risella nana, Crosse. *Id.*, p. 234.
1864. Risella plana, Crosse. *Id.*, p. 236, pl. xi., f. 2.
1864. Risella bruni, Crosse. *Id.*, p. 239, pl. xi., f. 3.
1864. Risella vittata, Crosse. *Id.*, p. 241.
1877. Risella aurata, T. Woods. P.L.S. N.S.W., vol. i., p. 245.
1877. Risella nana, T. Woods. *Id.*, p. 247.
1887. Risella lutea, Tryon. Man. Conch,, vol. ix., p. 262, pl. 49, f. 3.
1887. Risella aurata, Tryon. *Id.*, pl. 49, f. 6.
1887. Risella plana, Tryon. *Id.*, pl. 49, f. 10, 11, 12.
1887. Risella nana, Tryon. *Id.*, pl. 49, f. 13.
1887. Risella melanostoma, Tryon. *Id.*, p. 262.

Hab.—Very common between tide marks on all rocky parts of our coast.

Obs.—Being one of our commonest species, enormous numbers can be very easily collected from various localities for the study of the marked variations shown in the species. The paper given by the Rev. J. E. T. Woods before the Linnean Society of New South Wales in 1876 shows that gentleman to have possessed a clear grasp of the variations existing. There seems very little

doubt but that the most satisfactory treatment is to regard all the forms indicated above as variations of but one species. Although this will no doubt be somewhat perplexing to the young collector at first, he will eventually see the necessity for such treatment as he completes his series. As a rule it is very easy to pick out the form *R. nana* as a good variety, although the same cannot always be said of the forms under the names of *R. aurata* and *R. plana.*

Genus **Fossarina,** Adams and Angas, 1863.

Fossarina petterdi, Crosse.

1870. Fossarina petterdi, Crosse. Jour. de Conch., p. 303.
1871. Fossarina petterdi, Crosse. *Id.*, p. 323, pl. 12, f. 1.
1876. Fossarina simsoni, T. Woods. P.R.S. Tas., pp. 149, 150.
1881. Fossarina simsoni, T. Woods. T.R.S. Vic., vol. xvii., p. 81.
1887. Fossarina petterdi, Tryon. Man. Conch., vol. ix., p. 275, pl. 52, f. 20, 21.
1887. Fossarina simpsoni, Tryon. *Id.*, p. 275.
1900. Minos petterdi, Lodder. Cat. Tas. Shells, P.R.S. Tas., p. 12 (of reprint).

Hab.—Port Phillip; Sandringham; Frankston; Mornington; Sorrento.

Obs.—Tryon misspells T. Woods' species as F. simpsoni, and he also states that Hutton remarks that this species has the dentition and operculum of the Trochidae and not of the Littorinidae, and that it may possibly be an Adeorbis. T. Woods himself in the Transactions of the Royal Society of Victoria, after dealing with the description of F. funiculata, states that this shell closely resembles F. simsoni, nobis, which is identical with F. petterdiana, Crosse, a prior name.

Fossarina brazieri, Angas.

1871. Fossarina brazieri, Angas. P.Z.S. Lond., p. 18, pl. 1, f. 24.
1881. Fossarina funiculata, T. Woods. T.R.S. Vic., vol. xvii., p. 81. pl. , f. 6, 7.

1887. Fossarina funiculata, Tryon. Man. Conch., vol. ix., pp. 275, 276, pl. 52, f. 18, 19.

1887. Fossarina brazieri, Tryon. *Id.*, p. 275, pl. 52, f. 17.

1900. Minos funiculata, Lodder. Cat. Tas. Shells, P.R.S. Tas., p. 12 (of reprint).

Hab.—Port Phillip; Frankston; Sorrento.

Obs.—The type of F. funiculata is in the National Museum, Melbourne, and is located in a case of New South Wales shells, but, judging by T. Woods' paper, the shell was collected in Victoria by Mr. J. F. Bailey.

Family Neritidae.

Genus **Nerita**, Adamson, 1757.

Nerita melanotragus, E. A. Smith.

1842. Nerita nigra, Gray (non Chemnitz). In Dieffenbach's New Zealand, vol. ii., p. 240.

1855. Nerita atrata, Reeve (non Chemnitz, nec Deshayes). Conch. Icon., vol. ix., pl. 4, f. 16.

1865. Nerita atrata, Angas. P.Z.S. Lond., p. 175.

1867. Nerita atrata, Angas. *Id.* p. 212.

1873. Nerita atrata, Hutton. Cat. N.Z. Moll., p. 29.

1880. Nerita atrata, Hutton. Man. N.Z. Moll., p. 89.

1883. Nerita atrata, Sowerby. Thes. Conch., pts. 39, 40, p. 110, pl. 465 (3 Gen.), f. 41.

1884. Nerita melanotragus, E. A. Smith. Alert collection Zool., p. 69, No. 82.

1884. Nerita saturata, Hutton. P.L.S. N.S.W., vol. ix., pt. ii., p. 354.

1886. Nerita punctata, Watson (non Quoy and Gaimard). Chall. Zool., vol. xv., p. 132, No. 4.

1888. Nerita atrata, Tryon. Man. Conch., vol. x., p. 26, pl. 8, f. 40.

1900. Nerita melanotragus, Hedley. P.L.S. N.S.W., vol. xxv., pp. 500-502.

Hab.—Coast generally where rocky.

Obs.—This is a very widely distributed species in Australia, and a considerable amount of confusion has existed as to the correct name to be applied to it. Mr. C. Hedley has entered

very fully into this subject recently, and shows that at any rate N. punctata cannot stand for our shell, a conclusion with which we fully agree. Considerable trouble surrounds the names of N. nigra and N. atrata, and the simplest way out of the difficulty was in the introduction of a new name by E. A. Smith as N. melanotragus. The same course suggested itself to Hutton about the same time, and, thanks to Mr. Hedley, it has been shown that Smith's name has priority, its date being 1st August, 1884, whereas Hutton's was August 19th of the same year.

Family Liotiidae.

Genus Liotia, Gray, 1842.

Liotia australis, Kiener.

1839. Delphinula australis, Kiener. Icon. Coq. Viv., vol. x., p. 8, pl. 4, f. 7.

1843. Delphinula australis, Reeve. Conch. Icon., vol. i., pl. 4, f. 20.

1853. Delphinula australis, Kiener. Conch. Cab., Delphinula, p. 18, No. 23, pl. 5, f. 13.

1888. Liotia (Liotina) australis, Tryon. Man. Conch., vol. x., p. 112, pl. 36, f. 18, 19.

1899. Liotia australis, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 225.

Hab.—Port Phillip; Western Port; Puebla Coast; Sorrento, Back Beach; Lorne; Portland.

Liotia subquadrata, T. Woods.

1878. Liotia subquadrata, T. Woods. P.L.S. N.S.W., vol. ii., p. 236.

1899. Liotia subquadrata, Tate. T.R.S. S.A., vol. xxiii., pt. ii., pp. 227, 228.

Hab.—Western Port; Puebla Coast; Apollo Bay; Otway Coast, between Ryan's Den and Moonlight Head (Mr. P. J. Fulton).

Obs.—Professor Tate, at the place above quoted, refers to T. Woods' wrongful identification of a living Tasmanian species with a fossil form from Table Cape under the name of L. lamellosa, and this mistake was rectified by its author in his descrip-

tion of L. subquadrata, but the former authority also includes in his synonymy Cyclostrema immaculata, T. Woods.

LIOTIA TASMANICA, T. Woods.

1865. Liotia siderea, Angas (non Reeve). P.Z.S. Lond., p. 178.

1876. Liotia tasmanica, T. Woods. P.R.S. Tas. for 1875, p. 153.

1893. Liotia siderea, Adcock (non Reeve). Hand List Aq. Moll., S.A., p. 7, No. 284.

1895. Liotia tasmanica, Hedley. P.L.S. N.S.W., vol. ix., pp. 464, 465, three figures.

1899. Liotia tasmanica, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p, 226.

Hab.—Flinders, Western Port; Cowes (T. S. Hall). Dredged alive off Rhyll, from about 5 fathoms (Gatliff and Gabriel).

Obs.—Professor Tate, in his remarks on the Australian Liotidae, states that he has satisfied himself that the South Australian shell, under the name of L. siderea, is distinct from Reeve's species by an actual comparison with Reeve's type in the British Museum. Mr. Hedley's fine figures of this species render it easy of identification.

LIOTIA ANNULATA, T. Woods.

1878. Liotia annulata, T. Woods. P.R.S. Tas. for 1877, p. 121.

1884. Liotia compacta, Petterd. Jour. of Conch., Lond., p. 135.

1888. Liotia annulata, Tryon. Man. Conch., vol. x., p. 111, pl. 36, f. 20.

1899. Liotia annulata, Tate. T.R.S. S.A., vol. xxiii., pt. ii, pp. 225, 226, pl. 6, f. *7a*, *7b*.

Hab.—Corio Bay (J. Mulder); Port Phillip; Flinders, Western Port.

Obs.—Although the descriptions of the two above species do not exactly agree with one another, Professor Tate seems satisfied that they represent but one species, and as he appears to have had Petterd's type of L. compacta in his possession, and as he also figures the type shell, he should be in the best position to judge.

LIOTIA HEDLEYI, Pritchard and Gatliff.

1899. Liotia hedleyi, Pritchard and Gatliff, P.R.S. Vic., vol. xii., n.s., pt. i, p. 105, pl. 8., f. 8, 9, 10.

Hab.—Flinders, Western Port (J.H.G.); Sorrento; Puebla Coast (G.B.P.).

LIOTIA MAYANA, Tate.

1878. Liotia discoidea, T. Woods (non Reeve). P.R.S. Tas., 1877, p. 39.

1899. Liotia mayana, Tate. T.R.S. S.A., vol. xxiii., pt. 2, p. 227, pl. 6, f. *5a-5c*.

Hab.—Victoria (R. Tate).

Obs.—On this species Professor Tate remarks that in size and general appearance it is similar to L. subquadrata, T. Woods, but its suture is not so excavated, the aperture not so explanulately thickened, and its columella-margin is detached from the umbilical rim. He further makes out a closer affinity for this species with L. clathrata, Reeve, based upon actual comparison with examples of the latter species.

Family CYCLOSTREMATIDAE.

Note.—In his recent revision of the Australian Cyclostrematidae and Liotiidae, Professor Tate remarks that the limits of the genera Cyclostrema and Liotia are not so exact as to permit in all cases of a safe reference to one or the other. The same authority states that "the conchological characters largely relied on for Cyclostrema are a thin vitreous test, entire, simple non-varicosed aperture, and a multi-spiral operculum. For Liotia, a stout perlaceous test, last whorl descending at the front, aperture variced and entire, operculum spiral and covered with calcareous granules." Hence we have Liotia angasi, Crosse, Liotia lodderae, Petterd, and Liotia minima, T. Woods, referred to the above family Cyclostrematidae, the first being referred to under the generic title of Pseudoliotia, and the second and third under the generic name of Lodderia.

Genus **Cyclostrema**, Marryatt, 1818.

CYCLOSTREMA CAPERATUM, Tate.

1899. Cyclostrema caperatum, Tate. T.R.S. S.A., vol. xxiii., pt. ii., pp. 216, 217, pl. 7, f. 1*a*, 1*b*.

Hab.—Lakes Entrance, Gippsland, in shell sand (Dr. Pulleine).

Obs.—Mr. C. Hedley refers this species to the section Solariorbis of Teinostoma, as defined by Dall. Professor Tate himself indicates that he is not satisfied that the above shell belongs even to the Cyclostrematidae, let alone the genus Cyclostrema.

CYCLOSTREMA BRUNIENSIS, Beddome.

1883. Cyclostrema bruniensis, Beddome. P.R.S. Tas., 1882, p. 168.

1899. Skenea (?) brunniensis, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 224.

Hab.—Western Port; Sorrento, Port Phillip.

Obs.—Professor Tate remarks that he has received an aûthentic example of Beddome's species from Mr. May, of Tasmania, that he does not think it has the aspect of a Cyclostrema, but that he is unable to locate it generically. This species was identified for Mr. Gatliff by the late Mr. C. E. Beddome.

CYCLOSTREMA WELDII, T. Woods.

1877. Cyclostrema weldii, T. Woods. P.R.S. Tas., 1876, p. 147.

1877. Cyclostrema susonis, T. Woods. *Id.*, p. 147.

1877. Cirsonella australis, Angas, P.Z.S. Lond., p. 38, f. 16.

1888. Cyclostrema (Tubiola) weldii, Tryon. Man. Conch., vol. x., p. 95, pl. 33, f. 11.

1888. Cyclostrema (Tubiola) susonis, Tryon. *Id.*, p. 95, pl. 33, f. 10.

1888. Teinostoma (Cirsonella) australis, Tryon. *Id.*, p. 107, pl. 35, f. 83, 84.

1899. Cyclostrema australe, Tate. T.R.S. S.A., vol. xxiii., pt. ii., pp. 219-221.

Hab.—Sorrento, Port Phillip; Western Port.

Obs.—Professor Tate enters fully into the discussion of the identity of the above species in his revision, but gives, apparently on insufficient grounds, priority to the name applied by Angas; T. Woods' paper being read in August, 1876, while the volume containing it did not appear till 1877.

Cyclostrema angeli, T. Woods.

1877. Rissoa angeli, T. Woods. P.R.S. Tas., for 1876, pp. 153, 154.

1878. Rissoa angeli, T. Woods, *Id.*, for 1877, p. 122.

1899. Cyclostrema (Tubiola) angeli, Tate. T.R.S. S.A., vol. xxiii., pt. ii., pp. 218, 219.

Hab.—Western Port.

Obs.—The shell from Tasmania figured and mentioned in Tryon as Rissoa angeli, T. Woods, is not that species, as has already been pointed out by Professor Tate. The latter describes and figures this other species under the name of Cyclostrema crebresculptum, a species which we have not as yet collected from our shores.

Cyclostrema contabulatum, Tate.

1899. Cyclostrema contabulatum, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 222, pl. 7, f. 6.

Hab.—Western Port.

Obs.—Professor Tate remarks that this species is related to C. micron, but is narrowly umbilicated, and the whorls are shouldered. Our representatives of this species are not quite typical, in that the shouldering of the whorl is not distinct, but Professor Tate himself regards our shells as a variation of his species.

Cyclostrema harriettae, Petterd.

1884. Cyclostrema harriettae, Petterd. Jour. of Conch., p. 141, No. 24.

1899. Cyclostrema harriettae, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 215.

Hab.—Western Port; Sorrento; Puebla Coast.

Cyclostrema charopa, Tate.

1884. Cyclostrema micra, Petterd (non Woods, 1877). Jour. of Conch., p. 139.

1899. Cyclostrema charopa, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 217, pl. 7, f. 2*a*-2*c*.

Hab.—Dredged of Rhyll, Western Port.

Obs.—Tate records this species from South Australia and Tasmania, and states that he has compared his figured example,

which was obtained from Tasmania, with Mr. Petterd's type, and though a little larger he regards them as conspecific.

CYCLOSTREMA MAYII, Tate.

1899. Cyclostrema mayii, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 218, pl. 6, f. 4*a*-4*c*.

Hab.—Dredged off Rhyll, Western Port.

Obs.—The type of this species was obtained in Tasmania.

CYCLOSTREMA MICRA, T. Woods.

1877. Cyclostrema micra, T. Woods. P.R.S. Tas., p. 147.

1888. Cyclostrema (Tubiola) micra, Tryon. Man. Conch., vol. x., p. 95, pl. 33, f. 13.

1899. Cyclostrema micron, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 221.

Hab.—Dredged off Rhyll, Western Port.

Note.—There are two additional unidentified species of this genus.

Genus **Lodderia**, Tate, 1899.

LODDERIA LODDERAE, Petterd.

1884. Liotia lodderae, Petterd. Jour. of Conch., Lond., p. 135, No. 2.

1899. Liotia lodderae, Hedley. P.L.S. N.S.W., vol. xxiii., p. 802, three figures.

1899. Lodderia lodderae, Tate. T.R.S. S.A., vol. xxiii., pt. ii., p. 222.

Hab.—Flinders, Western Port; Puebla Coast.

LODDERIA MINIMA, T. Woods.

1878. Liotia minima, T. Woods. T.R.S. Vic., vol. xiv., p. 58.

1899. Lodderia minima, Tate. T.R S. S.A., vol. xxiii., pt. ii., p. 222.

Hab.—Brighton, Port Phillip; Western Port.

Obs.—The type of this species is in the National Museum, Melbourne, and on its label is indicated as having been found at Brighton.

Genus **Pseudoliotia**, Tate, 1898.

PSEUDOLIOTIA MICANS, A. Adams.

1850. Cyclostrema micans, A. Adams. P.Z.S. Lond., p. 43.
1864. Cyclostrema micans, Sowerby. Thes. Conch., p. 250, pl. 255, f. 7, 8, 27.
1864. Liotia angasi, Crosse. Jour. de Conch., p. 343, pl. 13, f. 4.
1871. Liotia speciosa, Angas. P.Z.S. Lond., p. 19, pl. 1, f. 26.
1874. Cyclostrema micans, Reeve. Conch. Icon., vol. xix., pl. 2, f. 9.
1874. Liotia gowllandi, Brazier. P.Z.S. Lond., p. 672, pl. 83, f. 1, 2.
1888. Cyclostrema micans, Tryon. Man. Conch., vol. x., p. 88, pl. 31, f. 17, 18.
1888. Liotia angasi, Tryon. *Id.*, p. 110, pl. 36, f. 4
1888. Liotia speciosa, Tryon. *Id.*, p. 110, pl. 36, f. 5.
1888. Liotia gowllandi, Tryon. *Id.*, p. 110, pl. 36, f. 7, 8.
1897. Cyclostrema micans, Tate. T.R.S. S.A., vol. xxi., p. 43.
1898. Cyclostrema micans, *var.* gracilior, Tate. *Id.*, vol. xxii., p. 71.
1899. Pseudoliotia micans, Tate. *Id.*, vol. xxiii., pp. 222, 223.
1899. Pseudoliotia micans, *var.* gowllandi, Tate. *Id.*, p. 223.

Hab.—Hobson's Bay (Nat. Mus.); St. Kilda, Sandringham, Sorrento, Port Phillip; Flinders, Western Port.

Obs.—Professor Tate appears to accept Pseudoliotia gowllandi as a good variety of this species, and records it from Western Port. He remarks that it is a micromorph with only two keels on the upper portion of the body whorl, with a tendency to fusion of the two peripheral keels and to obliteration of the basal rib.

Family RISSOIDAE.

Genus **Rissoa**, Fréminville, 1814.

RISSOA SALEBROSA, Frauenfeld.

1867. Rissoa salebrosa, Frauenfeld. Novara, p. 11, pl. 2, f. 15.

1887. Rissoia salebrosa, Tryon. Man. Conch., vol. ix., p. 327, pl. 66, f. 44.

1899. Rissoia salebrosa, Tate. T.R.S. S.A., vol. xxiii., p. 232.

Hab.—Western Port.

RISSOA INCIDATA, Frauenfeld.

1867. Rissoa incidata, Frauenfeld. Novara, p. 13, pl. 1, f. 19.

1887. Rissoia (Sabanaea) incidata, Tryon. Man. Conch., vol. ix., p. 339, pl. 63, f. 65.

1899. Rissoia (Sabanaea) incidata, Tate. T.R.S. S.A., vol. xxiii., p. 232.

Hab.—Western Port; Puebla Coast.

RISSOA BICOLOR, Petterd.

1884. Rissoa bicolor, Petterd. Jour. of Conch., Lond., vol. iv., No. 5, p. 137, No. 10.

1899. Rissoia (Sabanaea) bicolor, Tate. T.R.S. S.A., vol. xxiii., p. 232.

Hab.—Portsea, Port Phillip.

Obs.—Our representatives of this species from the above locality are narrower and more elongate than the usual Tasmanian form.

RISSOA OLIVACEA, Dunker.

1867. Rissoa olivacea, Dunker. Novara, p. 11, pl. 2, f. 14.

1884. Rissoa diemenensis, Petterd. Jour. of Conch., Lond., vol. iv., No. 5, p. 138, No. 13.

1887. Rissoia (Amphithalamus) olivacea, Tryon. Man. Conch., vol. ix., p. 339, pl. 66, f. 43.

1899. Rissoia (Amphithalamus) olivacea, Tate. T.R.S. S.A., vol. xxiii., p. 232.

Hab.—Sorrento, Port Phillip; Puebla Coast.

RISSOA PETTERDI, Brazier.

1884. Rissoa pulchella, Petterd (non Risso, 1826). Jour. of Conch., Lond., vol. iv., p. 138, No. 14.

1894. Rissoia (Amphithalamus) Petterdi, Brazier. P.L.S. N.S.W., p. 697.

1899. Rissoia (Amphithalamus) petterdi, Tate. T.R.S. S.A., vol. xxiii., p. 232.

Hab.—Western Port; Sorrento, Portsea, Port Phillip; Puebla Coast.

RISSOA CYCLOSTOMA, T. Woods.

1877. Rissoa cyclostoma, T. Woods. P.R.S. Tas., p. 153, No. 60.

1887. Rissoia (Cingula) cyclostoma, Tryon. Man. Conch., vol. ix., p. 344, pl. 71, f. 8.

1899. Rissoia (Amphithalamus) cyclostoma, Tate. T.R.S. S.A., vol. xxiii., pp. 232, 233.

Hab.—Western Port; Cape Schanck; Sorrento, Port Phillip; Puebla Coast.

RISSOA WOODSI, *nom. mut.*

1877. Rissoa cyclostoma, *var.* rosea, T. Woods (non Deshayes, nec Hutton). P.R.S. Tas., p. 154.

Hab.—Western Port; Port Phillip; Puebla.

Obs.—We regard this as a distinct species, and as Rissoa rosea cannot be accepted, as it is already twice pre-occupied, in the first place by Deshayes in 1863, and subsequently by Hutton in 1873, we propose to call it Rissoa woodsi.

RISSOA VERCONIS, Tate.

1884. Rissoa badia, Petterd (*non* Adams, 1861). Jour. of Conch., Lond., vol. iv., p. 138, No. 12.

1899. Rissoia (Amphithalamus) verconis, Tate. T.R.S. S.A., vol. xxiii., p. 233.

Hab.—Western Port; Puebla Coast.

RISSOA CONTABULATA, Frauenfeld.

1867. Rissoa (Anabathron) contabulata, Frauenfeld. Novara, p. 13, pl. 2, f. 20*a*.

1887. Rissoia (Anabathron) contabulata, Tryon. Man. Conch., vol. ix., p. 341, pl. 69, f. 51.

1899. Rissoia (Anabathron) contabulata, Tate. T.R.S. S.A., vol. xxiii., p. 233.

Hab.—Flinders, Cowes, Western Port; Sorrento, Port Phillip.

Obs.—Figure 20*b* of Frauenfeld and figure 50 of Tryon apparently represent a distinct species.

RISSOA TENISONI, Tate.

1876. Cingulina australis, T. Woods (*non* G. B. Sowerby). P.R.S. Tas., p. 146.

1878. Rissoa (Cingulina) australis, T. Woods. *Id.*, p. 151.

1898. Rissoa (Onoba) australis, Suter. Proc. Malac. Soc., p. 4.

1899. Rissoia (Onoba) tenisoni, Tate. T.R.S. S.A., vol. xxiii., pp. 233, 234.

1900. Rissoa tenisoni, Hedley. P.L.S. N.S.W., vol. xxv., pt. iii., p. 505, pl. 25, f. 4.

Hab.—Coast generally.

Obs.—This is our commonest species of this genus, and is very easily recognised, being a small white shell with strong spiral ridges. It has been figured for the first time only recently by Mr. C. Hedley.

RISSOA ATKINSONI, T. Woods.

1877. Rissoa (Cingula) atkinsoni, T. Woods. P.R.S. Tas., p. 153.

1887. Rissoia (Microsetia) atkinsoni, Tryon. Man. Conch., vol. ix., p. 354, pl. 71, f. 10.

1889. Rissoia (Setia) atkinsoni, Tate. T.R.S. S.A., vol. xxiii., p. 234,

Hab.—Dredged off Rhyll, Western Port; Puebla coast.

RISSOA ATROPURPUREA, Dunker.

1867. Rissoa atropurpurea, Dunker. Novara, p. 13, pl. 2, f. 21.

1887. Rissoia (Microsetia) atropurpurea, Tryon. Man. Conch., vol. ix., p. 355, pl. 71, f. 1.

1889. Rissoia (Setia) atropurpurea, Tate. T.R.S. S.A., vol. xxiii., p. 234.

Hab.—Dredged off Rhyll, Western Port.

RISSOA NITENS, Dunker.

1867. Rissoa nitens, Dunker. Novara, p. 13, pl. 2, f. 22.

1887. Rissoia (Microsetia) nitens, Tryon. Man. Conch., vol. ix., p. 355, pl. 71, f. 100.

1889. Rissoia (Setia) nitens, Tate. T.R.S. S.A., vol. xxiii., p. 234.

Hab.—Dredged off Rhyll, Western Port.

RISSOA SOPHIAE, Brazier.

1882. Rissoa (Setia) flamia, Beddome. P.R.S. Tas., p. 169, No. 16.

1883. Rissoia (Setia) sophiae, Brazier, mss.

1887. Rissoia (Setia) flamia, Tryon. Man. Conch., vol. ix., p. 359.

1894. Rissoia (Setia) sophiae, Henn and Brazier. P.L.S. N.S.W., vol. ix., 2nd ser., p. 174, No. 74.

1895. Rissoia (Setia) flamia, Brazier. *Id.*, p. 697.

1899. Rissoia (Setia) beddomei, Tate. T.R.S. S.A., vol. xxiii., p. 234.

Hab.—Western Port.

Obs.—Brazier, in the Proceedings of the Linnean Society of New South Wales, volume ix., n.s., p. 698, states that this is "a minute turbinated shell, white, with red diagonal flames, and about one of the most common species we have. A large number were sent to Mr. Angas as far back as 1876, with other species; about the time I named this in MS. I received sea-worn specimens from Mr. Petterd; having Mr. Beddome's types before me the matter is now at rest." That is, Brazier was satisfied to drop his name and accept Beddome's. Professor Tate regards Beddome's name as an orthographical blunder, and apparently thinks it should have been spelt flammea. On referring to Beddome's paper, it may be readily noticed that there are several printers' errors, apparently showing that the proof-sheets were never corrected, and, in view of this, it seems very likely that flammea may have been meant. If this be so, it is then found that R. flammea has already been pre-occupied by Dunker in 1866, and Professor Tate has proposed the new name of R. beddomei. It seems to us, however, that if flamia cannot be accepted as a name for this species, the name that should stand would be R. sophiae, Brazier.

RISSOA MELANOCHROMA, Tate.

1877. Rissoa melanura, T. Woods (non Adams, 1850). P.R.S. Tas., p. 153, No. 62.

1887. Rissoia (Cingulina) melanura, Tryon. Man. Conch., vol. ix., p. 358, pl. 71, f. 7.

1899. Rissoia (Cingulina) melanochroma, Tate. T.R.S. S.A., vol. xxiii., p. 234.

Hab.—Flinders, Cowes, Western Port; Sorrento, Port Phillip.

RISSOA HULLIANA, Tate.

1876. Dunkeria fasciata, T. Woods (non Requien, 1848). P.R.S. Tas., p. 146.

1877. Rissoa (Alvania) fasciata, T. Woods. *Id.*, p. 152.

1893. Rissoa (Alvania) hullii, Tate. Adcock's Hand List of S.A. Moll., p. 7.

1899. Rissoia (Alvania) hulliana, Tate. T.R.S. S.A., vol. xxiii., p. 235.

Hab.—Fairly common, Port Phillip and Western Port, also well distributed along the coast.

RISSOA STRANGEI, Brazier.

1884. Rissoa lineata, Petterd (non Risso, 1826). Jour. of Conch., Lond., vol. iv., p. 137, No. 8.

1894. Rissoia (Apicularia) strangei, Brazier. P.L.S. N.S.W., vol. ix., p. 173, pl. 14, f. 11.

1895. Rissoia (Apicularia) strangei, Brazier. *Id.*, p. 695.

1899. Rissoia (Alvania), strangei, Tate. T.R.S. S.A., vol. xxiii., p. 235.

Hab.—Western Port; Puebla coast.

RISSOA CHEILOSTOMA, T. Woods.

1873. Rissoa plicata, Hutton (non Deshayes, 1838). Cat. N.Z. Moll., p. 29.

1877. Rissoa (Alvania ?) cheilostoma, T. Woods. P.R.S. Tas., p. 152, No. 58.

1877. Alvania elegans, Angas (non Adams, 1851). P.Z.S. Lond., p. 174, pl. 26, f. 15.

1878. Rissoa (Oina) australis, Sowerby. Reeve Conch. Icon., vol. xx., pl. 13, f. 123.

1880. Rissoina plicata, Hutton. Man. N.Z. Moll., p. 80.

1885. Eglisia plicata, Hutton. P.L.S. N.S.W., vol. ix., p. 939.

1887. Rissoia (Alvania) cheilostoma, Tryon. Man. Conch., vol. ix., pp. 366, 392, pl. 68, f. 91.

1887. Rissoia (Alvania) elegans, Tryon. *Id.*, p. 364, pl. 66, f. 46.

1898. Rissoia (Alvinia) plicata, Suter. Proc. Malac. Soc. Lond., vol. iii., p. 6.

1899. Rissoia (Alvinia) cheilostoma, Tate. T.R.S. S.A., vol. xxiii., p. 235, 236.

Hab.—Port Phillip; Western Port.

RISSOA PEREXIGUA, Tate and May.

1878. Rissoina minutissima, T. Woods (non Michelin). P.R.S. Tas., p. 122.

1900. Rissoia perexigua, Tate and May. T.R.S. S.A., vol. xxiv., p. 100.

Hab.—Western Port.

Obs.—This species was identified for us by Mr. May, who stated that he had examined T. Woods' type in the Hobart Museum.

RISSOA MARIAE, T. Woods.

1876. Rissoa (Cingula) mariae, T. Woods. P.R.S. Tas., p. 147.

1887. Rissoia (Microsetia) mariae, Tryon. Man. Conch., vol. ix., p. 354, pl. 71, f. 9.

Hab.—Western Port; Cape Schanck; Port Phillip; Puebla Coast.

Obs.—Professor Tate in his paper on the Rissoidae, 1899, excludes this species, as he regards it as Diala varia. We do not agree with him.

RISSOA TASMANICA, T. Woods.

1876. Eulima tasmanica, T. Woods. P.R.S. Tas., p. 29.

Hab.—Port Fairy.

Obs.—T. Woods states that he only doubtfully refers this species to Eulima. We have a shell from Port Fairy which appears to answer well to T. Woods' description, but we prefer to regard it as a Rissoa.

RISSOA APPROXIMA, Petterd.

1884. Rissoa approxima, Petterd. Jour. of Conch., Lond., vol. iv., p. 138, No. 11.

1899. Rissoia (Microsetia) approxima, Tate. T.R.S. S.A,, vol. xxiii., p. 234.

Hab.—Western Port.

RISSOA SIMSONI, Tate and May.

1900. Rissoia (Amphithalamus) simsoni, Tate and May. T.R.S. S.A., vol. xxiv., p. 100.

Hab.—Port Fairy (Rev. T. Whan).

NOTE.—We have at least eight unidentified species of Rissoas, about which we hope to be able shortly to give some account.

Genus **Rissoina**, d'Orbigny, 1840.

RISSOINA GERTRUDIS, T. Woods.

1876. Rissoina gertrudis, T. Woods. P.R.S. Tas., p. 146.

1887. Rissoina gertrudae, Tryon. Man. Conch., vol. ix., p. 372, pl. 55, f. 39.

1899. Rissoina gertrudis, Tate. T.R.S. S.A., vol. xxiii., p. 237.

Hab.—Victoria (Tate).

RISSOINA HANLEYI, Schwartz.

1860. Rissoina hanleyi, Schwartz. Familie Rissoiden, p. 64, pl. 4, f. 28.

1887. Rissoina hanleyi, Tryon. Man. Conch., vol. ix., p. 370, pl. 55, f. 21.

1899. Rissoina hanleyi, Tate. T.R.S. S.A., vol. xxiii., p. 237.

Hab.—Victoria (Tate).

RISSOINA NIVEA, A. Adams.

1851. Rissoina nivea, A. Adams. P.Z.S. Lond., p. 265.

1880. Rissoina lirata, Angas. P.Z.S. Lond., p. 417, pl. 40, f. 11.

1887. Rissoina lirata, Tryon. Man. Conch., vol. ix., p. 373, pl. 54, f. 10.

1887. Rissoina (Schwartziella) nivea, Tryon. *Id.*, p. 379, pl. 55, f. 24.

1899. Rissoina nivea, Tate. T.R.S. S.A., vol. xxiii., pp. 237, 239, 240.

Hab.—Victoria (Tate)

RISSOINA D'ORBIGNYI, A. Adams.

1851. Rissoina d'orbignyi, A. Adams. P.Z.S. Lond., p. 265.

1878. Rissoa d'orbignyana, Reeve. Conch. Icon., vol. xx., pl. 1., f. 7.

1887. Rissoina (Morchiella) spirata, Tryon (non Sowerby). Man. Conch., vol. ix., p. 388, pl. 58, f. 28.

1889. Rissoina spirata, Tate (non Sowerby). T.R.S. S.A., pp. 237, 239, 240.

Hab.—A common species, generally distributed.

RISSOINA VARIEGATA, Angas.

1867. Rissoa variegata, Angas. P.Z.S. Lond., p. 113, pl. 13, f. 19.

1878. Rissoa variegata, Reeve. Conch. Icon., vol. xx., pl. 8, f. 64.

1887. Rissoina variegata, Tryon. Man. Conch., vol. ix., p. 370, pl. 56, f. 43-46.

1899. Rissoina variegata, Tate. T.R.S. S.A., vol. xxiii., p. 237.

Hab.—Point Roadknight.

RISSOINA ELEGANTULA, Angas.

1880. Rissoina elegantula, Angas. P.Z.S. Lond., p, 417, pl. 40, f. 10.

1887. Rissoina striata, Tryon (non Quoy and Gaimard). Man. Conch., vol. ix., p. 385, pl. 58, f. 13.

1899. Rissoina (Zebinella) elegantula, Tate. T.R.S. S.A., vol. xxiii., pp. 238, 242.

Hab.—Port Phillip; Western Port; Barwon Heads; Puebla Coast.

RISSOINA CRASSA, Angas.

1871. Rissoina crassa, Angas. P.Z.S. Lond., p. 17, pl. 1, f. 16.

1878. Rissoa crassa, Reeve. Conch. Icon., vol. xx., pl. 8, f. 70.

1887. Rissoina (Rissolina) rissoi, Tryon (non Audouin). Man. Conch., vol. ix., p. 378, pl. 55, f. 20, and pl. 68, f. 6.

1899. Rissoina (Rissolina) crassa, Tate. T.R.S. S.A., vol. xxiii., pp. 238, 243.

Hab.—Western Port; Puebla Coast.

RISSOINA FLEXUOSA, Gould.

1861. Rissoina flexuosa, Gould. Proc. Boston Soc., Nat. Hist., vol. vii., p. 400.

1867. Rissoa turricula. Angas. P.Z.S. Lond., p. 114, pl. 13, f. 20.

1872. Rissoina angasi, Pease. Amer. Jour. Conch., vol. vii., p. 20.

1878. Rissoa turricula, Reeve. Conch. Icon., vol. xx., pl. 8, f. 69.

1878. Rissoa flexuosa, Reeve. *Id.*, pl. 11, f. 97.

1885. Rissoina flexuosa, Weinkauff. Conch. Cab., p. 88, pl. 15*d*, f. 13.

1887. Rissoina (Schwartziella) flexuosa, Tryon. Man. Conch.. vol. ix., p. 380, pl. 68, f. 1, 2.

1899. Rissoina (Rissolina) flexuosa, Tate. T.R.S. S.A., vol. xxiii., pp. 243, 244.

Hab.—Coast generally.

Family TURBINIDAE.

Genus **Phasianella**, Lamarck, 1804.

PHASIANELLA AUSTRALIS, Gmelin.

1788. Buccinum australe, Gmelin. Syst. Nat., p. 3490, No. 173.

?1788. Buccinum tritonis, Chemnitz. Conch. Cab., vol. ix., pt. ii., p. 38, pl. 120, f. 1033, 1034.

1822. Phasianella bulimoides, Lamarck. Anim. S. Vert., vol. vii., p. 52.

Phasianella varia, Lamarck. Encyc. Meth., pl. 449. f. 1*a*, *b*, *c*.

1834. Phasianella bulimoides, Quoy and Gaimard. Astrolabe Zool., vol. iii., p. 235, pl. 59, f. 1-7.

1839. Phasianella bulimoides, Lamarck. Anim. S. Vert., (3rd ed. Deshayes and Edwards), vol. iii., p. 586.

1853. Phasianella australis, Philippi. Conch. Cab. (ed. Küster), p. 2, pl. 1, f. 1-7, and pl. 2, f. 1.
1859. Phasianella decorata, Chenu. Man. de Conch., vol. i., p. 343, f. 2530.
1862. Phasianella australis, Reeve. Conch. Icon., vol. xiii., pl. 1, f. 1, and pl. 2, f. 1.
1862. Phasianella venusta, Reeve. *Id.*, pl. 2, f. 2.
1877. Phasianella pulchella, T. Woods (non Recluz). P.R.S. Tas., p. 141.
1878. Phasianella delicatula, T. Woods. *Id.*, p. 38.
1884. Phasianella australis, Sowerby. Thes. Conch., vol. v., p. 149, pl. 475, f. 2-6.
1888. Phasianella australis, Tryon. Man. Conch., vol. x., p. 164, pl. 37, f. 22-28, and pl. 38, f, 46.
1888. Phasianella australis, *var.* subsanguinea, Pilsbry in Tryon. Man. Conch., vol. x., p. 165, pl. 38, f. 52.

Hab.—Common in Port Phillip where weed and sand are associated, Corio Bay and Sorrento may be specially mentioned; Western Port; Puebla Coast; Lorne; Warrnambool; Port Fairy.

PHASIANELLA VENTRICOSA, Quoy and Gaimard.

1834. Phasianella ventricosa, Quoy and Gaimard. Astrolabe Zool., vol. iii., p. 237, pl. 59, f. 8, 9.
1839. Phasianella solida, Deshayes in Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 588.
1843. Phasianella perdix, Gray in Menke. Moll. Nov. Holl., p. 12, No. 43.
1843. Phasianella brevis, Menke. *Id.*, No. 45.
1853. Phasianella turgida, Philippi. Conch. Cab., p. 5, pl. 2, f. 7-10, and pl. 5, f. 4.
1859. Phasianella delesserti, Chenu. Man. de Conch., vol. i., p. 343, f. 2526.
1862. Phasianella sanguinea, Reeve. Conch. Icon., vol. xiii., pl. 3, f. 3*a*, *b*, *c*.
1862. Phasianella zebra, Reeve. *Id.*, f. 4.
1862. Phasianella venosa, Reeve. *Id.*, f. 5*a*, *b*, *c*.

1862. Phasianella ventricosa, Reeve. *Id.*, f. 6*a*, *b*.
1862. Phasianella reticulata, Reeve. *Id.*, f. 7.
1884. Phasianella zebra, Sowerby. Thes. Conch., vol. v., p. 149, pl. 475, f. 9.
1884. Phasianella reticulata, Sowerby. *Id.*, p. 150, pl. 475, f. 1.
1884. Phasianella ventricosa, Sowerby. *Id.*, p. 151, pl. 476, f. 18.
1884. Phasianella venosa, Sowerby. *Id.*, f. 24.
1884. Phasianella sanguinea, Sowerby. *Id.*, f. 33.
1888. Phasianella ventricosa, Tryon. Man. Conch., vol. x., p. 165, pl. 38, f. 39, 40, 41, 42, 43, 45.

Hab.—Relatively uncommon in Port Phillip. Abundant in Western Port. Puebla Coast; Warrnambool; Port Fairy; Portland.

Obs.—Amongst the species of this genus described by Menke in his Mollusca of New Holland, are two under the names of P. preissi and P. lehmanni, which are described as being somewhat solid shells, and we are therefore inclined to think that they may also be synonyms of P. ventricosa, but not of the P. australis, which can hardly be described as of that character. Adcock's Hand List of the South Australian Shells includes these two names amongst the synonyms of P. australis, but with this we cannot agree.

PHASIANELLA VARIEGATA, Lamarck.

1822. Phasianella variegata, Lamarck. Anim. S. Vert., vol. vii., p. 53.
1839. Phasianella variegata, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 578, No. 3.
1841. Phasianella variegata, Delessert. Recueil de coq., pl. 37, f. 10.
1847. Phasianella unifascialis, Kiener. Icon. Coq. Viv., p. 7, pl. 4, f. 2.
1862. Phasianella nivosa, Reeve. Conch. Icon., vol. xiii., pl. 4, f. 8*a*, *b*, *c*.
1862. Phasianella fulgurata, Reeve. *Id.*, f. 9.

1864. Phasianella angasi, Crosse. Jour. de Conch., p. 344, pl. 13, f. 5.

1884. Phasianella fulgurata, Sowerby. Thes. Conch., vol. v., p. 150, pl. 476, f. 22.

1884. Phasianella angasi, Sowerby. *Id.*, f. 27.

1888. Phasianella variegata, Tryon. Man. Conch., vol. x., p. 179, pl. 39, f. 97, 98. P. nivosa, pl. 38, f. 49. P. fulgurata, pl. 38, f. 55.

1888. Phasianella angasi, Tryon. *Id.*, p. 180, pl. 39, f. 67, 68.

1888. Phasianella unifascialis, Tryon. *Id.*, p. 179, pl. 39, f. 96.

1897. Phasianella variegata, Tate. T.R.S. S.A., vol. xxi., p. 43.

Hab.—Port Phillip; Western Port.

Obs.—P. jaspidea, Reeve, P. lentiginosa, Reeve, and P. grata, Philippi, have been given as synonyms of this species, but we have been unable to determine upon what grounds, as they appear to us to be entirely distinct from our form.

Phasianella rosea, Angas.

1867. Eutropia (Tricolia) rosea, Angas. P.Z.S. Lond., p. 114, pl. 13, f. 24.

1888. Phasianella (Tricolia) rosea, Tryon. Man. Conch., vol. x., p. 174, pl. 39, f. 92.

Hab.—Western Port; Cape Schanck; Puebla Coast; Cape Otway; Moonlight Head.

Genus Turbo, Linnaeus, 1758.

Turbo undulatus, Martyn.

1784. Limax undulatus, Martyn. Univ. Conch., vol. i., f. 29.

1786. Limax anguis, Martyn. *Id.*, vol. ii., f. 70.

1788. Turbo undulatus, Chemnitz. Conch. Cab., vol. x., p. 296, pl. 169, f. 1640, 1641.

1834. Turbo undulatus, Quoy and Gaimard. Astrolabe Zool., vol. iii., p. 221, pl. 60, f. 9-14.

1839. Turbo undulatus, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 570, No. 13.

1846. Turbo anguis, Philippi. Conch. Cab., p. 70, No. 34, pl. 16, f. 8.

1846. Turbo undulatus, Philippi. Conch. Cab., pp. 40, 41, pl. 10, f. 5, 6.

1848. Turbo undulatus, Reeve. Conch. Icon., vol. iv., pl. 1, f. 3*a*, *b*.

1867. Lunella undulata, Angas. P.Z.S. Lond., p. 213, No. 171.

1873. Turbo undulatus, Hutton. Cat. N.Z. Moll., p. 34.

1880. Turbo undulatus, Hutton. Man. N.Z. Moll., p. 91.

1888. Turbo undulatus, Pilsbry in Tryon. Man. Conch., vol. x., p. 216, pl. 42, f. 40.

1888. Turbo anguis, Pilsbry in Tryon. *Id.*, index, p. 272: said to equal T. porphyrites, Martyn.

1893. Turbo (Marmorostoma) undulatus, Brazier. P.L.S. N.S.W., 2nd ser., vol. viii., pt. i., p. 112.

Hab.—One of our commonest littoral species in all rocky localities.

Obs.—Mr. Brazier states that, in his opinion, Mr. Pilsbry has evidently made a mistake in regarding T. anguis, Martyn, and T. porphyrites, Martyn, as identical.

Turbo stamineus, Martyn.

1784. Limax stamineus, Martyn. Univ. Conch., vol. ii., f. 71.

1788. Turbo torquatus, Gmelin. Syst. Nat., p. 3597, No. 106.

1788. Turbo torquatus, Chemnitz. Conch. Cab., vol. x., p. 293, vign. 24, f. *a*. *b*.

1822. Turbo torquatus, Lamarck. Anim. S. Vert., vol. vii., p. 40.

1834. Turbo torquatus, Quoy and Gaimard. Astrolabe Zool., vol. iii., p. 222, pl. 60, f. 15-18.

1839. Turbo torquatus, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 568, No. 3.

1842. Turbo staminea, Gray. App. to Dieffenbach's N.Z., vol. ii., p. 236, No. 67.

1843. Turbo torquatus, Lamarck. Anim. S. Vert. (Deshayes ed.), vol. ix., p. 187, No. 3.
Turbo lamellosus, Broderip. Zool. Jour., vol. v., p. 331, sup. pl. 49, f. 2.
? 1846. Turbo torquatus, Philippi. Conch. Cab., p. 39, pl. 10, f. 1, 2.
? 1846. Turbo lamellosus, Philippi. *Id.*, p. 69, pl. 16, f. 6.
1848. Turbo torquatus, Reeve. Conch. Icon., vol. iv., pl. 6, f. 26.
1854. Ninella staminea, Adams. Genera, vol. i., p. 396, pl. 44, f. 1, *a*, *b*, *c*.
1865. Ninella staminea, Angas. P.Z.S. Lond., p. 177, No. 134.
1873. Turbo torquatus, Fischer. Icon. Coq. Viv., p. 15, sp. 7, pl. 4, f. 1.
1886. Turbo (Ninella) staminea, Watson. Chall. Zool., vol. xv., p. 127, No. 6.
1888. Turbo (Ninella) stamineus, Tryon. Man. Conch., vol. x., p. 212, pl. 42. f. 38, and pl. 49, f. 46.

Hab.—Polwarth Coast.

TURBO GRUNERI, Philippi.

1846. Turbo gruneri, Philippi. Zeits. f. Malak., p. 98, No. 6.
? 1846. Turbo gruneri, Philippi. Conch. Cab., p. 52, pl. 12, f. 7, 8.
1848. Turbo circularis, Reeve. Conch. Icon., vol. iv., pl. 10, f. 46.
1854. Senectus circularis, H. and A. Adams. Genera, vol. i., p. 392.
1865. Senectus circularis, Angas. P.Z.S. Lond., p. 177.
1873. Turbo circularis, Fischer. Icon. Coq. Viv., p. 99, pl. 42, f. 1.
1877. Turbo (Senectus) circularis, T. Woods. P.R.S. Tas., p. 38.
1885. Turbo circularis, Sowerby. Thes. Conch., vol. v., p. 203, sp. 42, pl. 4, and pl. 496, f. 37.
1887. Turbo gruneri, Brazier. T.R.S. S.A., vol. ix., p. 125.

1888. Turbo circularis, Tryon. Man. Conch., vol. x., p. 214, pl. 41, f. 24, and pl. 56, f. 82.

1893. Turbo gruneri, Brazier. P.L.S. N.S.W., vol. viii., pt. i., p. 110.

Hab.—Sorrento, Port Phillip; Balnarring, Flinders, San Remo, Western Port; Cape Schanck; Anderson's Inlet.

Genus **Leptothyra**, Carpenter in Dall, 1871.

LEPTOTHYRA ROSEA, T. Woods.

1876. Monilea rosea, T. Woods. P.R.S. Tas., p. 154.

1880. Collonia roseo-punctata, Angas. P.Z.S. Lond., p. 417, pl. 40, f. 8.

1888. Leptothyra roseo-punctata, Tryon. Man. Conch., vol. x., p. 258, pl. 57, f. 54, 55.

1889. Monilea (Minolia) rosea, Tryon. Man. Conch., vol. xi., p. 264.

Hab.—Sorrento, Port Phillip; Western Port.

LEPTOTHYRA JOSEPHI, T. Woods.

1877. Cyclostrema josephi, T. Woods. P.R.S. Tas., p. 147.

1888. Cyclostrema (Tubiola) josephi, Tryon. Man. Conch., vol. x., p. 95, pl. 33, f. 9.

1899. Collonia josephi, Tate. T.R.S. S.A., vol. xxiii., p. 224.

Hab.—Western Port.

LEPTOTHYRA, n. sp.

Hab.—Dredged off Rhyll, Western Port.

Genus **Astralium**, Link, 1807.

ASTRALIUM SQUAMIFERUM, Koch.

Trochus squamiferus, Koch. Abbild. und Besch., neuer Conch., pl. 4, f. 9.

1822. Trochus fimbriatus, Lamarck. Anim. S. Vert., vol. vii., p. 12.

1839. Trochus fimbriatus, Lamarck. *Id.* (3rd ed. Deshayes and Edwards), vol iii., p. 546, No. 8.

1843. Trochus fimbriatus, Lamarck. *Id.* (Deshayes ed.), vol. ix., p. 125.

1855. Carinidea fimbriata, Swainson. P.R.S. Van Diemen's Land, p. 39, pl. 6, f. 3, 4.

1861. Trochus squamiferus, Reeve. Conch. Icon., vol. xiii., pl. 11, f. 60.

1876. Trochus fimbriatus, Fischer, Kiener. Icon. Coq. Viv., pl. 32, f. 2*a*, 2.

1888. Astralium fimbriatum, var. squamiferus, Tryon. Man. Conch., vol. x., p. 240, pl. 54, f. 52.

1888. Astralium (Cyclocantha) fimbriatum, Tryon. *Id.*, p. 239, pl. 54, f. 46, 48, 49.

Hab.—Cape Schanck; Warrnambool. Dredged off Rhyll, Western Port.

Astralium aureum, Jonas.

1844. Trochus aureus, Jonas. Zeits. f. Malak., p. 168.

1855. Carinidea granulata, Swainson. P.R.S. Van Diemen's Land, vol iii., p. 40, pl. 6, f. 5, 6.

1861. Trochus aureus, Reeve. Conch. Icon., vol. xiii., pl. 11, f. 58, 59.

1877. Carinidea tasmanica, T. Woods. P.R.S. Tas., p. 142.

1888. Astralium (Cyclocantha) aureum, Tryon. Man. Conch., vol. x., p. 240, pl. 64, f. 52-54.

Hab.—Rather common in Port Phillip and Western Port, also occurring along the coast generally.

Obs.—Regarding Carinidea tasmanica, T. Woods states that he had always regarded this as a young variety of Trochus aureus, Jonas, but the form is so constant and so very distinct that he decided to describe it as new. We, however, feel pretty sure that his first opinion was correct. Regarding Liotia incerta, T. Woods, Professor Tate remarks that Petterd regarded this shell as an immature Astralium tasmanicum, but that such opinion cannot be correct. We are inclined to agree with Professor Tate, for the description of L. incerta does not enable us to regard it as a synonym of the above, but a specimen labelled L. incerta, in the Tasmanian case in the old National Museum, certainly is the young of A. aureum. This specimen may perhaps have been obtained from Mr. Petterd. Professor Tate inclines to the opinion that T. Woods' species incerta is a Liotia, but probably an immature L. tasmanica.

Family TROCHIDAE.

Genus Clanculus, Montfort, 1810.

CLANCULUS LIMBATUS, Quoy and Gaimard.

1834. Trochus limbatus, Quoy and Gaimard. Astrolabe, vol. iii., p. 245, pl. 63, f. 1-6.

1848. Trochus morum, Philippi. Zeits. f. Malak., p. 109.

? 1846. Trochus morum, Philippi. Conch. Cab., p. 265, pl. 39, f. 5.

? 1846. Trochus limbatus, Philippi. *Id.*, p. 212, pl. 31, f. 10–12.

1851. Trochus variegatus, A. Adams (non Auton). P.Z.S. Lond., p. 160, No. 27.

1876. Trochus limbatus, Fischer. Icon. Coq. Viv., p. 214, pl. 71, f. 2.

1889. Trochus (Clanculus) limbatus, Tryon. Man. Conch., vol. xi., p. 50, pl. 11, f. 39, 40.

1889. Trochus (Clanculus) variegatus, Tryon. *Id.*, p. 50, pl. 14, f. 19.

1889. Trochus (Clanculus) morum, Tryon. *Id.*, p. 55, pl. 14, f. 31, 32.

Hab.—Port Fairy; Cape Schanck; Back Beach, Sorrento; San Remo and Flinders, Western Port.

Obs.—There can be very little doubt about the identification of this species, for the figures supplied by Quoy and Gaimard are good. Our shell agrees well with Adams' original description, but not with the figure representing it given by Tryon. In general habit our species agrees closely with C. omalomphalus, A. Adams, from New South Wales, but amongst other features it may be noted that ours is larger and more coarsely marked. From the species we have identified as C. flagellatus, Philippi, the above differs in its more conical habit, flatter whorls, and details of ornament.

CLANCULUS FLAGELLATUS, Philippi.

1848. Trochus flagellatus, Philippi. Zeits. f. Malak., p. 105.

? 1846. Trochus flagellatus, Philippi. Conch. Cab., p. 267, pl. 39, f. 9.

1889. Trochus (Clanculus) flagellatus, Tryon. Man. Conch., vol. xi., p. 55, pl. 19, f. 3, 4.

Hab.—Coast generally.

Obs.—This species has apparently been confused with T. anus, Philippi, and there are many resemblances between the two, but the latter has distinctive apertural and umbilical characters. It has been identified, and we think probably correctly, as C. conspersus, A. Adams. P.Z.S. Lond., 1851, p. 163, No. 46.

Clanculus personatus, Philippi.

1846. Monodonta ringens, Philippi (non Menke). Zeits. f. Malak., p. 99.

? 1846. Trochus personatus, Philippi. Conch. Cab., p. 78, No. 78, pl. 14, f. 7.

1889. Trochus (Clanculus) personatus, Tryon. Man. Conch., vol. xi., p. 56, pl. 14, f. 29, 30, and pl. 19, f. 91, 92.

Hab.—San Remo; Lorne.

Clanculus undatus, Lamarck.

Monodonta undata, Lamarck. Encyc. Meth., pl. 447, f. 3*a*, *b*.

1822. Trochus undatus, Lamarck. Anim. S. Vert., vol. vii., p. 28, No. 61.

1828. Trochus smithii, Wood. Index Test., sup., p. 17, pl. 5, f. 20*a*.

1839. Trochus undatus, Lamarck. Anim. S. Vert. (3rd ed., Deshayes and Edwards), vol. iii., p. 554, No. 61.

? 1846. Trochus undatus, Philippi. Conch. Cab., p. 221, No. 276, pl. 33, f. 4.

1859. Trochus (Clanculus) undatus, Chenu. Man. de Conch., vol. i., p. 357, f. 2648.

1876. Trochus undatus, Fischer. Icon. Coq. Viv., p. 168, pl. 58, f. 2.

1889. Trochus (Clanculus) undatus, Tryon. Man. Conch., vol. xi., p. 65, pl. 40, f. 1.

Hab.—Sorrento, Port Phillip; Cape Schanck; Flinders; Western Port; Kilcunda; Anderson's Inlet; Airey's Inlet; Lorne.

CLANCULUS MAUGERI, Wood.

1828. Trochus maugeri, Wood. Index Test. sup., p. 220, pl. 5, f. 27*a*.

?1846. Trochus maugeri, Philippi. Conch. Cab., p. 240, No. 305, pl. 36, f. 9.

1876. Trochus maugeri, Fischer. Icon. Coq. Viv., p. 218, pl. 72, f. 1.

1878. Clanculus maugeri, T. Woods. P.R.S. Tas., p. 40.

1889. Trochus (Clanculus) maugeri, Tryon. Man. Conch., vol. xi., p. 64, pl. 10, f. 25-27.

Hab.—Victoria (T. Woods).

CLANCULUS ALOYSII, T. Woods.

1876. Clanculus aloysii, T. Woods. P.R.S. Tas., p. 155.

1876. Clanculus philomenae, T. Woods. P.R.S. Tas., p. 155.

1889. Trochus (Clanculus) aloysii, Tryon. Man. Conch., vol. xi., p. 59, pl. 14, f. 20-23.

1889. Trochus (Clanculus) philomenae, Tryon. *Id.*, p. 61.

Hab.—Port Phillip; Western Port; San Remo; dredged alive off Point Cooke, from 5 fathoms.

Obs.—Having a good series of representatives of this species, we note considerable variation in form, the keeling of the body whorl being noticeable in this respect, being very prominent sometimes, and almost absent at others, as also the sutural channelling. We have thus been unable to make any specific distinction between the two species of Tenison Woods.

CLANCULUS DUNKERI, Koch.

1843. Trochus (Monodonta) dunkeri, Kock. In Philippi, Abbild. und Besch. neuer Conch., vol. i., pt. iii., p. 67, pl. 2. f. 5.

?1846. Trochus dunkeri, Philippi. Conch. Cab., 2nd ed. p. 237, No. 300, pl. 36, f. 5.

1865. Clanculus rubens, Angas. P.Z.S. Lond., p. 178, No. 144.

1876. Trochus dunkeri, Fischer. Icon. Coq. Viv., p. 361, pl. 96, f. 2.

1878. Clanculus rubens, T. Woods. P.R.S. Tas., p. 40.

1886. Trochus (Clanculus) dunkeri, Brazier. P.R.S. Tas., p. 202.

1887. Trochus (Clanculus) dunkeri, Brazier. T.R.S. S.A., vol. ix., pp. 121, 122.

1889. Trochus (Clanculus) dunkeri, Tryon. Man. Conch., vol. xi., pp. 61, 62, pl. 14, f. 26, 27, and pl. 15, f. 57, 58.

Hab.—Western Port.

Obs.—Mr. Brazier in a paper entitled the "Trochidae and other genera of Mollusca from Tasmania with their synonyms," in the Proc. Roy. Soc. Tas., for 1886, p. 203, makes the following remarks on this species:—"Mr. Angas always returned this species named as Clanculus rubens of A. Adams. There was no such species as Clanculus rubens ever described by A. Adams. Mr. Angas was the first who published the name in the P.Z.S. London, 1865, p. 178."

Clanculus plebeius, Philippi.

? 1846. Trochus plebeius, Philippi. Conch. Cab., p. 326, pl. 46, f. 10.

1851. Trochus plebeius, Philippi. Zeits. f. Malak., p. 41.

1851. Clanculus nodoliratus, A. Adams. P.Z.S. Lond., p. 163.

1876. Trochus plebeius, Fischer. Icon. Coq. Viv., p. 243, pl. 83, f. 2, 2*a*.

1877. Gibbula multicarinata, T. Woods. P.R.S. Tas., p. 142, No. 30.

1877. Clanculus angeli, T. Woods. *Id.*, pp. 144, 145.

1880. Clanculus nodoliratus, T. Woods. *Id.*, p. 70.

1889. Trochus (Clanculus) plebeius, Tryon. Man. Conch., vol. xi., p. 79, pl. 10, f. 19–22, and pl. 13, f. 1, 2.

1889. Trochus (Clanculus) angeli, Tryon. *Id.*, p. 60.

Hab.—Coast generally. Obtained alive in rock pools at low tide, and dredged alive from three to five fathoms.

Obs.—This is by far the commonest species of this genus and may be obtained in great numbers at almost any part of our coast.

Clanculus ochroleucus, Philippi.

?1853. Trochus ochroleucus, Philippi. Conch. Cab., p. 243, pl. 36, f. 16.

1889. Trochus (Clanculus) ochroleucus, Tryon. Man. Conch., vol. xi., p. 57, pl. 13, f. 95, 96.

Hab.—Balnarring Coast, Western Port; Puebla Coast.

Genus **Monodonta**, Lamarck, 1799.

s. g. **Austrocochlea**, Fischer, 1885.

Austrocochlea constricta, Lamarck.

1822. Monodonta constricta, Lamarck. Anim. S. Vert., vol. vii., p. 36.

1829. Monodonta zebra, Menke. Verg. Malak. Conch. Samml., p. 17.

1834. Trochus taeniatus, Quoy and Gaimard. Astrolabe, vol. iii., p. 249, pl. 63, f. 15-17.

1834. Trochus constrictus, Quoy and Gaimard. *Id.*, p. 251, pl. 63, f. 23-27.

1839. Monodonta constricta, Lamarck. Anim. S. Vert. (3rd ed. Deshayes and Edwards), vol. iii., p. 565.

1841. Monodonta constricta, Delessert. Recueil, pl. 36, f. 11.

1843. Monodonta constricta, Menke. Moll. Nov. Holl., p. 13, No. 49.

1843. Monodonta constricta, Lamarck. Anim. S. Vert., (Desh. ed.), vol. ix., p. 180.

?1846. Trochus constrictus, Philippi. Conch. Cab., p. 159, pl. 26, f. 2*b*, 3.

?1846. Trochus zebra, Philippi. Conch. Cab., p. 160, pl. 26, f. 4.

1851. Labio porcatus, A. Adams. P.Z.S. Lond., p. 179.

1859. Trochocochlea multicarinata, Chenu. Man. de Conch., vol. ii., p. 360, f. 2678.

1876. Trochus constrictus, Fischer. Icon. Coq. Viv., p. 178, pl. 59, f. 2, and pl. 60, f. 4.

1876. Trochocochlea multicarinata, Fischer. *Id.*, p. 184, pl. 60, f. 3.

1876. Trochus extenuatus, Fischer. *Id.*, p. 330, pl. 103, f. 1.

1889. Monodonta (Austrocochlea) constricta, Tryon. Man. Conch., vol. xi., p. 90, pl. 20, f. 6, 7.

1889. Monodonta (Austrocochlea) zebra, Tryon. *Id.*, pl. 20, f. 20; *var.* porcata, pl. 20, f. 10, 11; multicarinata, pl. 20, f. 12.

Hab.—All rocky portions of coast line.

Obs.—This is one of the commonest, if not the commonest species inhabiting our coast, and has also a very wide Australasian range. In consequence of its enormous numbers, very considerable variation in habit, keeling, and colouring, may be noted, but there is usually no difficulty in identifying the species.

AUSTROCOCHLEA STRIOLATA, Quoy and Gaimard.

1828. Trochus concamerata, Wood. Index Test. Sup., pl. 6, f. 35.

1834. Trochus striolatus, Quoy and Gaimard. Astrolabe, vol. iii., p. 253, pl. 63, f. 18-22.

1851. Labio fuligineus, Adams. P.Z.S. Lond., p. 180.

1876. Trochus striolatus, Fischer. Icon. Coq. Viv., p. 187, pl. 61, f. 3.

1886. Trochus fuligineus, Watson. Chall. Zool., vol. xv., p. 67, pl. 4, f. 11.

1889. Monodonta (Neodiloma) striolatus, Tryon. Man. Conch., vol. xi., p. 99, pl. 19, f. 97, 98.

Hab.—Port Phillip; Point Nepean to Flinders; Western Port; Puebla, and a few other rocky parts, but much less common than the preceding species. As no description was given of T. concamerata, Wood, we have followed other conchologists in not adopting that name.

Diloma, Philippi, 1845.

DILOMA ODONTIS, Wood.

1828. Trochus odontis, Wood. Index Test. Sup., p. 17, pl. 6, f. 37.

?1846. Trochus odontis, Philippi. Conch. Cab., p. 144, No. 174, pl. 24, f. 7.

1854. Diloma odontis, H. and A. Adams. Genera, vol. i., p. 420.
1865. Diloma odontis, Angas. P.Z.S. Lond., p. 182.
1887. Trochus (Diloma) odontis, Brazier. T.R.S. S.A., vol. ix., p. 119.
1889. Monodonta (Chlorodiloma) odontis, Tryon. Man. Conch., vol xi., p. 111., pl. 62, f. 66, 67.

Hab.—Common on the rocks at low water in Port Phillip and Western Port, but ranges also along the coast in less abundance.

DILOMA ADELAIDAE, Philippi.

? 1846. Trochus adelaidae, Philippi. Conch. Cab., p. 140, No. 168, pl. 24, f. 1.
1876. Gibbula depressa, T. Woods. P.R.S. Tas., p. 154.
1876. Trochus adelaidae, Fischer. Icon. Coq. Viv., p. 210.
1877. Diloma australis, T. Woods. P.R.S. Tas., p. 145, No. 37.
1881. Gibbula tesserula, T. Woods. T.R.S. Vic., vol. xvii., p. 81, pl. 1, f. 3-5.
1887. Trochus (Diloma) adelaidae, Brazier. T.R.S. S.A., vol. ix., p. 120.
1889. Gibulla depressa, Tryon. Man. Conch., vol. xi., p. 234, pl. 40, f. 36, 37.
1889. Monodonta (Chlorodiloma) adelaidae, Tryon. *Id.*, p. 111, pl. 35, f. 22, 23.
1889. Gibbula tesserula, Tryon. *Id.*, p. 234, pl. 32, f. 66, 67, 68.

Hab.—Port Phillip; Western Port; Puebla Coast; Lorne; Warrnambool; Anderson's Inlet.

Obs.—The description of young specimens of the above species no doubt accounts for the peculiarity of the synonymy, as several features are noticeable in the young that are not always readily picked out in the adult form.

Genus **Phasianotrochus**, Fischer, 1885.

PHASIANOTROCHUS ROSEA, Lamarck.

1822. Monodonta rosea, Lamarck. Anim. S. Vert., vol. vii., p. 38, No. 22.
1822. Monodonta lineata, Lamarck. *Id.*, No. 23.

1828. Trochus badius, Wood. Index. Test., sup., pl. 6, f. 46.

1834. Trochus australis, Quoy and Gaimard. Astrolabe, vol. iii., p. 248, pl. 63, f. 13, 14.

1841. Monodonta rosea, Delessert. Recueil, No. 22, pl. 37, f. 3*a*, *b*, *c*.

1841. Monodonta lineata, Delessert. *Id.*, No. 23, pl. 37, f. 4*a*, *b*.

1846. Trochus roseus, Philippi. Conch. Cab., p. 134, No. 156, pl. 23, f. 7.

1846. Trochus peronii, Philippi. *Id.*, p. 135, No. 158, pl. 23, f. 9.

1846. Trochus quoyi, Philippi. *Id.*, p. 139, No. 165, pl. 23, f. 17.

1846. Trochus badius, Philippi. *Id.*, p. 137, No. 162, pl. 23, f. 14.

1859. Elenchus fulmineus, Chenu. Man. de Conch., vol. i., p. 360, f. 2671.

1889. Cantharidus (Phasianotrochus) badius, Tryon. Man. Conch., vol. xi., p. 131, pl. 45, f. 57, 58.

1889. Cantharidus (Phasianotrochus) peroni, Tryon. *Id.*, p. 132, pl. 34, f. 12-14.

Hab.—Western Port; Anderson's Inlet; Puebla Coast; Warrnambool; Port Fairy.

Obs.—While looking into the synonymy of this species, it seems pretty obvious that rosea should be accepted in preference to lineata. Mr. C. Hedley has kindly drawn our attention to a recent note by Mr. Pilsbry in the "Nautilus" for May 1901, in which he states that he believes it has not been noticed that Bulimus eximius, Perry, Conchology, plate 30, figure 2 (1811), is identical with Cantharidus badius, Wood; and Bulimus carinatus, Perry, f. 1, is C. peronii, Philippi. We have not yet had an opportunity of seeing Perry's work, and are therefore unable to express an opinion on the matter, except that carinatus is the name that should stand for this species if Pilsbry be correct.

PHASIANOTROCHUS IRISODONTES, Quoy and Gaimard.

1834. Trochus irisodontes, Quoy and Gaimard. Astrolabe, vol. iii., p. 246, pl. 63, f. 7-12.

1843. Monodonta virgata, Menke. Moll. Nov. Holl., p. 15, No. 59.
1846. Trochus iriodon, Philippi. Conch. Cab., p. 136, No. 159, pl. 23, f. 10, 11, 13.
1846. Trochus virgulatus, Philippi. *Id.*, p. 136, No. 160, pl. 23, f. 12.
1876. Trochus iridon, Fischer. Icon. Coq. Viv., p. 160, pl. 52, f. 3.
1889. Cantharidus (Phasianotrochus) irisodontes, Tryon. Man. Conch., vol. xi., p. 133, pl. 46, f. 64-66.

Hab.—Coast generally, a very common species.

PHASIANOTROCHUS APICINUS, Menke.

1843. Monodonta apicinus, Menke. Moll. Nov. Holl., p. 15, No. 58.
1846. Trochus apicinus, Philippi. Conch. Cab., p. 133, pl. 23, f. 5.
1889. Cantharidus (Phasianotrochus) apicinus, Tryon. Man. Conch., vol. xi., p. 134, pl. 34, f. 6, 7.

Hab.—Portland; Port Fairy.

PHASIANOTROCHUS BELLULUS, Dunker.

1845. Trochus bellulus, Dunker. Abbild., vol. ii., pt. 2, pl. 7, f. 6.
1846. Trochus bellulus, Phillippi. Conch. Cab., p. 134, No. 157, pl. 23, f. 8.
1876. Trochus bellulus, Fischer. Icon. Coq. Viv., p. 154, pl. 51, f. 1.
1889. Cantharidus (Phasianotrochus) bellulus, Tryon. Man. Conch., vol. xi., p. 133, pl. 34, f. 5.

Hab.—Portland.

Genus **Bankivia**, Krauss, 1848.

BANKIVIA FASCIATA, Menke.

1830. Phasianella fasciata, Menke. Syn. Meth. Moll., pp. 51, 141.
1830. Phasianella fulminata, Menke. *Id.*, p. 141.
1830. Phasianella undatella, Menke. *Id.*, p. 141.

1848. Bankivia varians, Krauss. Sudafric. Moll., p. 105, pl. 5, f. 7.

?1846. Bankivia varians, Philippi. Conch. Cab., p. 33, pl. 5, f. 1-5.

1851. Bankivia purpurascens, A. Adams. P.Z.S. Lond., p. 171.

1851. Bankivia major, A. Adams. *Id.*, p. 171.

1851. Bankivia nitida, A. Adams. *Id.*, p. 172.

1854. Bankivia varians, Adams. Genera., vol. i., p. 425, pl. 48, f. 6.

1859. Bankivia varians, Chenu. Man. de. Conch., vol. i., p. 360, f. 3674-3675,

1867. Bankivia varians, Angas. *Id.*, p. 216.

1886. Trochus (Bankivia) fasciatus, Watson. Chall. Zool., vol. xv., p. 64, No. 22.

1889. Cantharidus (Bankivia) fasciatus, Tryon. Man. Conch., vol. xi., p. 139, pl. 40, f. 28-33.

Hab.—Portland to Warrnambool; Anderson's Inlet; Kilcunda (W. H. Ferguson).

Genus **Leiopyrga**, H. and A. Adams. 1863.

LEIOPYRGA PICTURATA, H. and A. Adams.

1863. Leiopyrga picturata, H. and A. Adams. A.M.N.H., 3rd ser., vol. xi., p. 19.

1865. Leiopyrga picturata, Angas. P.Z.S. Lond., p. 181.

1867. Leiopyrga picturata, Angas. *Id.*, p. 216.

1884. Bankivia (Leiopyrga) picturata, E. A. Smith. Alert Zool., p. 75, pl. 6, f. *c*.

1886. Trochus (Leiopyrga) picturata, Watson. Chall. Zool., vol. xv., p. 65.

1889. Bankivia (Leiopyrga) picturata, Tryon. Man. Conch., vol. xi., p. 140, pl. 45, f. 46-48.

Hab.—Portland.

LEIOPYRGA OCTONA, Tate.

1891. Leiopyrga octona, Tate. T.R.S. S.A., vol. xiv., pt. 2, pp. 260, 261, pl. 11, f. 5.

Hab.—Port Fairy (Rev. W. T. Whan).

Genus **Thalotia**, Gray, 1847.

THALOTIA CONICA, Gray.

1827. Monodonta conica, Gray. King's Austr. Survey, App., vol. ii., p. 479, No 28.
1828. Trochus pictus, Woods. Index Test., Sup., p. 17, pl. 5, f. 28.
1843. Monodonta turrita, Menke. Moll. Nov. Holl., p. 15, No. 57.
1847. Thalotia conica, Gray. P.Z.S. Lond., p. 145.
?1846. Trochus conicus, Philippi. Conch. Cab., p. 130, No. 150, pl. 23, f. 1.
1851. Thalotia picta, A. Adams. P.Z.S. Lond., p. 172, No. 1.
1854. Thalotia conica, H. and A. Adams. Genera, vol. i., p. 420, pl. 48, f. 1.
1876. Trochus conicus, Fischer. Icon. Coq. Viv., p. 135.
1878. Thalotia conica, T. Woods. P.R.S. Tas., p. 41.
1878. Thalotia dubia, T. Woods. P.R.S. Vic., vol. xiv., p. 58.
1881. Thalotia conica, Tate. P.L.S. N.S.W., vol. vi., p. 394.
1887. Trochus (Thalotia) conicus, Brazier. P.R.S. Tas., p. 197.
1887. Trochus (Thalotia) conicus, Brazier. T.R.S. S.A., vol. ix., p. 117.
1889. Cantharidus (Thalotia) conicus, Tryon. Man. Conch., vol. xi., p. 141, pl. 46, f. 73.
1900. Thalotia conica, Gatliff. V.N., vol. xvii., No. 6, p. 112, two figures.

Hab.—Port Phillip; Western Port; Puebla; Warrnambool; Port Fairy.

Obs.—The type of Thalotia dubia, T. Woods, is in the National Museum collection, Meldourne, and was originally obtained from Clark's Island, Bass Strait. Examination of the type shows, undoubtedly, that it must be regarded as the same as Thalotia conica, Gray, its young growth for about four whorls being identical, but after that a distorted abnormal growth begins and then follows a much greater convexity of the whorls than is

usually found in that species. This type shell was figured by one of us in the "Victorian Naturalist" last year.

Genus **Cantharidus**, Montfort, 1810.

CANTHARIDUS PULCHERRIMUS, Wood.

1828. Trochus pulcherrimus, Wood. Index Test., Sup., p. 18, pl. 6, f. 45.

1843. Trochus preissii, Menke. Moll. Nov. Holl., p. 17, No. 69.

1845. Trochus pulcherrimus, Philippi. Abbild. Besch. n. Conch., vol. ii., pt. ii., pl. 7, f. 1.

? 1846. Trochus pulcherrimus, Philippi. Conch. Cab., p. 132, No. 153, pl. 23, f. 4, and pl. 43, f. 11.

1865. Thalotia pulcherrima, Angas. P.Z.S. Lond., p. 179, No. 151.

1876. Trochus pulcherrimus, Fischer. Icon. Coq. Viv., p. 137, pl. 46, f. 4, 4*a*.

1878. Thalotia mariae, T. Woods. T.R.S. Vic., p. 58.

1881. Thalotia pulcherrima, Tate. P.L.S. N.S.W., vol. vi., p. 396.

1887. Trochus (Cantharidus) pulcherrimus, Brazier. P.R.S. Tas. p. 196.

1887. Trochus (Cantharidus) pulcherrimus, Brazier. T.R.S. S.A., vol. ix., pp. 118, 119.

1889. Cantharidus pulcherrimus, Tryon. Man. Conch., vol. xi., p. 125, pl. 46, f. 78, 79.

Hab.—Coast generally.

Obs.—One of our commonest and most widely distributed species. The type of Thalotia mariae, T. Woods, is in the Australian Museum, Sydney.

CANTHARIDUS RAMBURI, Crosse.

1822. Phasianella elegans, Lamarck (non Gmelin). Anim. S. Vert., vol. vii., p. 53, No. 4.

1843. Phasianella elegans, Lamarck. *Id.*, Deshayes, 2nd ed., vol. ix., p. 243.

1843. Trochus lehmanni, Menke (non Kiener). Moll. Nov. Holl., p. 18, No. 70.

1845. Trochus lehmanni, Philippi. Abbild. Besch. n. Conch., vol. ii., p. 37, pl. 7, f. 2.

?1846. Trochus pictus, Philippi (non Wood). Conch. Cab., p. 139, No. 166, pl. 23, f. 18, 19.

1851. Thalotia lehmanni, A. Adams. P.Z.S. Lond., p. 172, No. 4.

1854. Thalotia lehmanni, H. and A. Adams. Genera, vol. i., p. 420.

1864. Trochus ramburi, Crosse. Jour. de Conch., p. 342, pl. 13, f. 3.

1876. Trochus lesueuri, Fischer. Icon. Coq. Viv., pp. 129, 420.

1877. Thalotia picta, T. Woods. P.R.S. Tas., p. 41.

1887. Trochus (Cantharidus) lesueuri, Brazier. P.R.S. Tas., p. 194.

1887. Trochus (Cantharidus) lesueuri, Brazier. T.R.S. S.A., vol. ix., p. 116.

1889. Cantharidus lesueuri, Tryon. Man. Conch., vol. xi., p. 126, pl. 45, f. 52-54, and pl. 34, f. 9, 10.

1889. Cantharidus ramburi, Tryon. *Id.*, pp. 127, 469, pl. 45, f. 40.

Hab.—Coast generally, usually an associate with the preceding species.

Genus **Gibbula**, Risso, 1826.

GIBBULA TIBERIANA, Crosse.

1863. Trochus tiberianus, Crosse. Jour. d. Conch., p. 381, pl. 13, f. 2.

1864. Cantharidus decoratus, Adams and Angas. P.Z.S. Lond., p. 37.

1867. Cantharidus tiberianus, Angas. P.Z.S. Lond., p. 215.

1876. Gibbula aurea, T. Woods. P.R.S. Tas., p. 153.

1876. Trochus tiberianus, Fischer. Icon. Coq. Viv., p. 408, pl. 120, f. 2.

1877. Thalotia tesselata, T. Woods. T.R.S. Vic., vol. xiv., p. 58.

1889. Thalotia tesselata, Tryon. Man. Conch., vol. xi., p. 151.

1889. Cantharidus decoratus, Tryon. *Id.*, p. 153.

1889. Gibbula tiberiana, Tryon. *Id.*, p. 222, pl. 32, f. 53.

1889. Gibbula aurea, Tryon. *Id.*, p. 237.

Hab.—Generally distributed around Port Phillip, dredged alive from about 5 fathoms off Point Cooke; dredged alive on weed from 5 to 8 fathoms off Rhyll, Western Port; Flinders; Cape Schanck; Puebla.

Obs.—The type of Thalotia tesselata, T. Woods, is in the National Museum, Melbourne.

GIBBULA COXI, Angas.

1867. Gibbula coxi, Angas. P.Z.S. Lond., p. 115, pl. 13, f. 26.

1876. Trochus coxi, Fischer. Icon. Coq. Viv., p. 339, pl. 105, f. 3.

1889. Gibbula coxi, Tryon. Man. Conch., vol. xi., p. 231, pl. 31, f. 34, 35, and pl. 32, f. 69.

Hab.—Western Port.

GIBBULA PREISSIANA, Philippi.

1848. Trochus preissianus, Philippi. Zeits. f. Malak., p. 123.

?1846. Trochus preissianus, Philippi. Conch. Cab., p. 177, pl. 28, f. 3.

1851. Gibbula porcellana, A. Adams. P.Z.S. Lond., p. 186.

1876. Trochus preissianus, Fischer. Icon. Coq. Viv., p. 245, pl. 83, f. 3.

1877. Gibbula weldii, T. Woods. P.R.S. Tas., p. 143.

1889. Minolia preissiana, Tryon. Man. Conch., vol. xi., p. 261, pl. 41, f. 29.

1889. Gibbula weldii, Tryon. *Id.*, p. 236.

Hab.—Point Roadknight.

GIBBULA SULCOSA, A. Adams.

1851. Gibbula sulcosa, A. Adams. P.Z.S. Lond., p. 186.

1889. Gibbula sulcosa, Tryon. Man. Conch., vol. xi. p. 243.

Hab.—Point Roadknight.

GIBBULA LEGRANDI, Petterd.

1879. Fossarina legrandi, Petterd. Jour. of Conch., vol. ii., p. 104.

Hab.—A rather common little species widely distributed along our coast.

Note.—We have another small species of this genus hitherto unidentified.

Minolia, A. Adams, 1860.

MINOLIA PHILIPPENSIS, Watson.

1881. Trochus (Solariella) philippensis, Watson. J.L.S. Lond., vol. xv., p. 92.

1886. Trochus (Solariella) philippensis, Watson. Chall. Zool., vol. xv., p. 73, pl. 6, f. 10.

1889. Minolia philippensis, Tryon. Man. Conch., vol. xi., p. 271, pl. 36, f. 15, 16.

Hab.—Off the entrance to Port Phillip, 33 fathoms, sand (Challenger).

MINOLIA TASMANICA, T. Woods.

1877. Margarita (Minolia) tasmanica, T. Woods. P.R.S. Tas., p. 143, No. 33.

1878. Minolia vectiliginea, var. (?), T. Woods. T.R.S. Vic., vol. xiv., p. 59.

1889. Minolia tasmanica, Tryon. Man. Conch., vol. xi., p. 263, pl. 61, f. 38, 39, 40.

Hab.—Port Phillip.

Obs.—The Victorian specimens of this species are usually considerably larger than the Tasmanian type. The incorrect spelling and naming of Menke's species by T. Woods is worthy of note, and in his paper to the Royal Society of Victoria he regarded the Victorian shell as a probable variety. This and other species dealt with by him were presented to the National Museum, Melbourne, and this no doubt accounts for the fact that this shell is labelled type in that institution. We are perfectly satisfied that Menke's shell, M. vitiliginea, though of similar aspect from above, differs in its umbilical characters and in its more solid development. We have examples of Menke's species before us from Western Australia.

Genus **Calliostoma,** Swainson, 1840.

CALLIOSTOMA MEYERI, Philippi.

1848. Trochus meyeri, Philippi. Zeits. f. Malak., p. 101.
1849. Trochus meyeri, Philippi. Conch. Cab., p. 279, No. 362, pl. 41, f. 4.
1854. Trochus levis, Hombron and Jacquinot. Voy. au Pole Sud, vol. v., Zool., p. 56, mollusca, pl. 14, f. 17, 18.
1863. Zizyphinus armillatus, Reeve. Conch. Icon., vol. xiv., pl. 3, f. 19.
1876. Trochus meyeri, Fisher. Icon. Coq. Viv., p. 76, pl. 17, f. 2.
1887. Trochus (Zizyphinus) meyeri, Brazier. T.R.S. S.A., vol. ix., p. 121.
1888. Calliostoma meyeri, Tryon. Man. Conch., vol. x., pl. 41, f. 35.
1889. Calliostoma meyeri, Tryon. *Id.*, vol. xi., p. 336.

Hab.—Commonest in Western Port; also Puebla; Warrnambool; Portland (Maplestone); Anderson's Inlet (W. H. Ferguson).

CALLIOSTOMA TINCTUM, Watson.

1886. Trochus (Zizyphinus) tinctus, Watson. Chall. Zool., vol. xv., p. 63, No. 20, pl. 17, f. 2.
1889. Calliostoma tinctum, Tryon. Man. Conch., vol. xi., p. 353, pl. 16, f. 11, 11A.

Hab.—Off East Moncoeur Island, Bass Strait, 38 fathoms, sand (Challenger).

CALLIOSTOMA POUPINELI, Montrouzier.

1854. Zizyphinus comptus, A. Adams (non Philippi). P.Z.S. Lond., p. 38.
1863. Zizyphinus comptus, Reeve. Conch. Icon., vol. xiv., pl. 7, f. 48.
1875. Trochus (Zizyphinus) poupineli, Montrouzier. Jour. d. Conch., p. 40, pl. 4, f. 6.
1876. Trochus poupineli, Fischer. Icon. Coq. Viv., p. 387, pl. 116, f. 3.

1889. Calliostoma poupineli, Tryon. Man. Conch., vol. xi., p. 350, pl. 17, f. 41.

1894. Calliostoma purpureo-cinctum, Hedley. P.L.S. N.S.W., vol. ix., pt. 1, p. 35.

Hab.—Western Port.

CALLIOSTOMA ALLPORTI, T. Woods.

1876. Trochus (Zizyphinus) allporti, T. Woods. P.R.S. Tas., p. 155.

1889. Calliostoma allporti, Tryon. Man. Conch., vol. xi., p. 351, pl. 66, f. 22.

Hab.—Off Rhyll, Western Port, dredged from about six fathoms; Puebla Coast.

CALLIOSTOMA INCERTUM, Reeve.

1863. Zizyphinus incertus, Reeve. Conch. Icon., vol. xiv., pl. 5, f. 28.

1875. Zizyphinus incertus, T. Woods. T.R.S. Tas., p. 41.

1889. Calliostoma incertum, Tryon. Man. Conch., vol. xi., p. 351, pl. 17, f. 37, and pl. 65, f. 83.

Hab.—San Remo, Western Port.

CALLIOSTOMA LEGRANDI, T. Woods.

1876. Zizyphinus legrandi, T. Woods. P.R.S. Tas., p. 154.

1889. Calliostoma legrandi, Tryon. Man. Conch., vol. xi., p. 350, pl. 66, f. 23.

Hab.—Off Rhyll, Western Port, dredged from about five fathoms.

CALLIOSTOMA NOBILE, Philippi.

(?) 1846. Trochus nobilis, Philippi. Conch. Cab., p. 86, pl. 15, f. 6, and pl. 38, f. 1.

1863. Zizyphinus nobilis, Reeve. Conch. Icon., vol. xiv., pl. 2, f. 10.

1876. Trochus nobilis, Fischer. Icon. Coq. Viv., p. 309, pl. 98, f. 2.

1878. Zizyphinus nobilis, Brazier. P.L.S. N.S.W., vol. ii., p. 44.

1889. Calliostoma nobile, Tryon. Man. Conch., vol. xi., p. 349, pl. 15, f. 47, 48.

Hab.—West Head, Western Port.

CALLIOSTOMA, n. sp.

Hab.—Western Port.

Genus **Astele**, Swainson, 1855.

ASTELE SUBCARINATA, Swainson.

1854. Astele subcarinata, Swainson. P.R.S. Van Diemen's Land, vol. iii., p. 36, pl. 6, f. 1, 2.

1863. Eutrochus perspectious, A. Adams. P.Z.S. Lond., p. 506.

1877. Astele subcarinatus, T. Woods. P.R.S. Tas., p. 39.

1889. Calliostoma (Eutrochus) adamsi, Pilsbry. Man. Conch., vol. xi., p. 402.

1893. Astele subcarinata, Brazier. P.L.S. N.S.W., 2nd ser., vol. viii., pt. 1, pp. 107-110. Figured in text by C. Hedley.

Hab.—Western Port, San Remo.

Genus **Euchelus**, Philippi, 1847.

EUCHELUS BACCATUS, Menke.

1843. Monodonta baccata, Menke. Moll. Nov. Holl., p. 14, No. 51.

1846. Trochus aspersus, Koch. Zeits. f. Malak., p. 103, No. 23.

?1846. Trochus baccatus, Philippi. Conch. Cab., p. 173, No. 208, pl. 27, f. 13.

1851. Monodonta baccata, A. Adams. P.Z.S. Lond., p. 174, No. 9.

1865. Euchelus baccatus, Angas. P.Z.S. Lond., p. 179, No. 147.

1867. Euchelus baccatus, Angas. *Id.*, p. 215, No. 180.

1876. Trochus baccatus, Fischer. Icon. Coq. Viv., p. 292, pl. 94, f. 2, and pl. 115, f. 1.

1886. Trochus (Euchelus) baccatus, Watson. Chall. Zool., vol. xv. p. 53, No. 7.

1889. Euchelus baccatus, Tryon. Man. Conch., p. 435, pl. 62, f. 72, 73.

Hab.—Moderately common all along the coast.

Obs.—This species shows variation in form and coarseness of sculpture, occasional very elongate or even scalariform specimens being obtainable.

EUCHELUS SCABRIUSCULUS, Angas.

1867. Euchelus scabriusculus, Angas. P.Z.S. Lond., p. 215, No. 181.

1876. Trochus scabriusculus, Fischer. Icon. Coq. Viv., p. 374, pl. 114, f. 2.

1889. Euchelus (Herpetopoma) scabriusculus, Tryon. Man. Conch., vol. xi., p. 435, pl. 48, f. 12.

Hab.—Sandringham, Sorrento, Port Phillip.

Obs.—Tryon states that there was no description accompanying the name given by Messrs. Adams and Angas, and we have not been able to find any either. In Angas' list of 1867 in P.Z.S., this species is numbered 181, and marked with an asterisk, which meant that the species had been described from specimens in his own collection. Presumably this refers to the few brief particulars given by himself in the list, yet he gives the name E. scabriusculus, A. Adams and Angas, M.S., in Cuming Collection. Angas's own brief description is "a very small species differing from E. baccatus in its cancellated sculpture, and being umbilicated. Under stones, Port Jackson. Length, 2 lines."

EUCHELUS TASMANICUS, T. Woods.

1876. Euchelus tasmanicus, T. Woods. P.R.S. Tas., p. 152.

1877. Fossarus tasmanicus, T. Woods. P.R.S. Tas., p. 148.

1880. Fossarus tasmanicus, T. Woods. P.R.S. Tas., p. 70.

1889. Euchelus tasmanicus, Tryon. Man. Conch., vol. xi., p. 436.

Hab.—Cape Schanck; Western Port; Puebla.

Obs.—T. Woods admits his own mistake as above indicated.

Euchelus atratus, Gmelin.

?1789. Turbo atratus, Gmelin. Syst. Nat., vol. xiii., p. 3601, No. 53.

1822. Monodonta canaliculata, Lamarck. Anim. S. Vert., vol. vii., p. 37, No. 20.

1888. Euchelus atratus, Tryon. Man. Conch., vol. x., pl. 41, f. 25.

1889. Euchelus atratus, Tryon. *Id.*, vol. xi., p. 439.

Hab.—Portland (Mrs. A. Kenyon).

Obs.—Our shell agrees exactly with f. 25 given by Tryon, but the other figures given by him are not so satisfactory.

Art. XI.—*Some remains of an extinct Kangaroo in the Dune-Rock of the Sorrento Peninsula, Victoria.*

By J. W. GREGORY, D.Sc.

(Professor of Geology, Melbourne University).

[Read 11th July, 1901.]

Port Phillip Bay is nearly closed to the south by two lines of sand dunes, of which the eastern is known, after the principal settlement upon it, as the Sorrento Peninsula.

The peninsula is formed entirely of sand dunes, which extend for twenty miles, from Point Nepean on the west, to Cape Schanck on the east. The dune belt is broadest at the east, where, with its associated alluvial deposits, it is seven miles in width.

The only direct stratigraphical evidence as to the age of the Sorrento dune series is that, near Cape Schanck, it abuts against the "older volcanic" basalts, which are certainly the earlier in age.

The thickness of the dune series is considerable. A dune known as St. Paul's rises 176 feet above the sea. West of Sorrento is another to which the Admiralty Chart assigns the height of 225 feet. At Fowler's Cove the highest dune is 130 feet.[1] Wells have been sunk to the depth of three or four feet below sea level, where a plentiful supply of water has rendered further sinking unnecessary. There is, therefore, no direct evidence as to the full thickness of the dune formation in the Sorrento Peninsula. The minimum is 360 feet; and the fact that the beaches on the sea front are formed of pebbles of the dune sandstones and limestones shows that no other rocks are exposed for some depth below low tide line.

Throughout the body of this thick mass of dune formation no determinable fossils have yet been recorded. They may have been abundant; but all the calcareous material has been

[1] This is the height as determined trigonometrically by Mr. Fowler; the Admiralty Chart gives it at 117 feet.

dissolved and redeposited as the dune limestones, or in concretions around plant roots.[1] M'Coy[2] has recorded the occurrence of the extinct species *Arctocephalus williamsi* M'Coy, and *Phascolomys pliocenus*, M'Coy, and of the living Tasmanian *Sarcophilus ursinus* (Harris), at Queenscliff, on the western side of Port Phillip entrance, in the "sandy beds intercalated with the Pliocene Tertiary limestone." These fossils probably came from the western dune series.[3]

The dune series is strongly falsebedded. The dominant false dip is to the north and north-east. This fact suggests that the dune material drifted from the south and south-west, and that what are now the southern cliffs were formed on the northern slope of the dunes. The drift of the sand at present is still eastward and north-eastward. The sand patch in front of Mr. Fowler's house has, he tells me, travelled eastward for 20 yards during the last fifteen years.

The limestones also have a general slope downward to the north, having been deposited along the natural drainage plains. That the stratification is due to false bedding is shown by the vertical position of most of the concretions in places where the bedding is inclined.

A typical section of the dune series is shown at Fowler's Cove. At the top are three feet of sand supported by thin horizontal layers of limestones; then follow five feet of sands with abundant stem and root concretions; the dip in this bed increases in the lower part. At the base are fifteen feet of strongly falsebedded sands, dipping as much as 30° to the north-east.

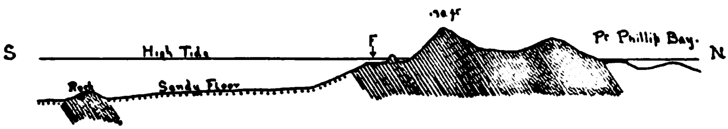
The existence of stacks of dune limestone along the foreshore also shows that marine denudation has pushed back the coast-line, and the dunes must at one time have extended some hundreds of yards further to the south than they do at present. This marine advance may have been due either to a subsidence of the land or a local rise in sea level; but a relatively greater elevation of the dune belt in recent geological times is almost certain.

1 A description of these fossil-like cylindrical concretions has been recently given by Mr. T. S. Hall, Vict. Nat. (1901) p. 47.

2 Prod. Pal. Vict., dec. v. (1877) p. 8, and dec. vii. (1882) p. 12.

3 Fragments of fossils have been recorded from the Otway dunes by Mr. R. Etheridge, Jnr. "Observations on the Sand Dunes of the Coast of Victoria." Trans. Roy. Soc. Vict., vol. xii. (1876), p. 8.

A transverse section across the dune belt showing the shore platform, and the position of the line of submerged rocks is given below. The fossil described in this note came from the position marked F.



In the absence of fossils we have only the scanty stratigraphical evidence as to the age of the dune series. On this ground Mr. Murray in his "Victoria. Geology and Physical Geography" (1895, p. 100), assigns the dunes to the "Post-Tertiary age, some of them being of comparatively ancient and others of quite recent date, or even now in process of formation." This conclusion is certainly correct for the later limit of the series; for aboriginal kitchen-middens are being buried by the dunes. These kitchen-middens consist of layers of shells, all of edible mollusca; the spiral gastropods have been broken at the mouth, so that the body could be extracted; the fractures are due to direct blows and not to abrasion; the shells, moreover, are embedded in a soil containing fragments of burnt wood and charcoal.

That the Sorrento dunes are therefore, in part, of recent date, admits of no doubt; but the age at which their formation began is uncertain. Hence the discovery of a vertebrate fossil in the lowest exposed part of the dune series is of interest.

This fossil was discovered independently by Mr. T. W. Fowler and Mr. C. S. Price in 1900. A broken tooth of it was extracted by Mr. T. S. Hall, and is now in the National Museum. The fossil was exposed at low tide on the surface of the shore platform at Fowler's Cove, about three miles from Sorrento. As the platform is being planed down by the surf, Mr. Fowler feared that the fossil would be destroyed and he kindly invited me to examine it with a view to securing it for the University collection. I accordingly visited the locality in March, 1901, with Mr. Fowler, Mr. D. Le Soeuf, and Mr. F. J. Spry. The speci-

men proved to be the remains of a kangaroo, for it included the characteristic innominate bone. Unfortunately the specimen was very incomplete. There was no trace of the skull, and the only relics of limbs was a broken femur. The rest of the fossil consisted of part of the vertebral column with the remains of about ten ribs, and fragment of a scapula. The bones were brittle and fragile, and they were imbedded in a hard, tough, sandy limestone. Owing to the limited time during which the fossil was exposed above the sea, its complete extraction would have been impossible, even had it been thought worth while to quarry out the whole of the five foot slab of limestone over which the bones were scattered.

Accordingly we devoted our attention to the pelvis, which was skilfully quarried out by Mr. Spry. We obtained also the best of the vertebrae, a fragment of a scapula, and some parts of ribs.

That the pelvis belongs to a kangaroo is obvious. The part shewn is the inner surface of the right innominate; most of the ilium is preserved, but the fore-end is broken off. The hinder-end of the ischium and nearly all the pubis are lost, but enough of the obturator foramen is shewn to enable its outline and size to be approximately determined. A photograph taken by Mr. Fowler some time before our visit showed most of the pectineal process and the outline of the proximal part of the pubis.

The following dimensions show the relative sizes of the fossil with the largest pelvis of *Macropus giganteus*, Zimm., in the University Biological Museum, and in the largest *Macropus* pelvis in the National Collection, which have been kindly shown me by Mr. T. S. Hall, and Mr. J. A. Kershaw, respectively.

	Fowler's Cove Fossil.	*Macropus giganteus*, Univ. Coll.	*Macropus* sp., Nat. Mus.	Owen's *Palorchestes*
From base of pectineal process to back of ilium	68 mm.	36 mm.	46 mm.	59 mm.
Thickness (dorso-ventral) of base of ilium	48 mm.	23 mm.	29 mm.	47 mm.
Width of ischium opposite middle of obturator foramen	54 mm.	24·5 mm.	30 mm.	50 mm.

It is therefore not probable that the fossil kangaroo is a *Macropus giganteus*. The Great Red Kangaroo (*M. rufus*, Desm.) is somewhat larger than the Great Grey Kangaroo. Lydekker gives the following measurements of the two species.[1]

	M. giganteus.	*M. Rufus.*
Length of head and body	60 in.	65 in.
Length of tail	36 in.	42 in.

The large pelvis in the National Museum may belong to *M. rufus*. But these measurements, as well as those of the skeleton given by Owen, show that *M. rufus*, the largest of living kangaroos, was much smaller than the fossil.

We must, therefore, turn to the great extinct kangaroos for comparison with the Fowler's Cove fossil.

From the general resemblance of the pelvis to that of *Macropus giganteus* it is natural first to compare the specimen with *M. titan*, Owen. This species is admittedly a close ally of *M. giganteus* and it has been suggested may be only a variety thereof. Its size was not much greater than that of even *M. rufus*. Owen's figures and measurements show the relative sizes of the two species. Thus the width of the distal end of the femur is 72 mm. in *M. titan*,[2] and 62 mm. in *M. rufus*.[3] Comparing the dentition, the length of the last molar in *M. rufus* is shewn by Owen's figure to be 15·5 mm.; that of *M. titan* is 27 mm. The length of the last four upper molars is 50 mm. in *M. rufus*,[4] 59 mm. in *M. titan*.[5] Hence *M. titan* did not exceed *M. rufus* by nearly as much as this fossil did.

Owen has figured[6] part of an innominate, which he referred to *Palorchestes azael*. The measurements are given in the fourth column on p. 142. They show that the Fowler's Cove fossil is even larger than in the giant *Palorchestes*. The characters of the innominates however, so far as the data are comparable, agree so closely that they no doubt belong to the same species.

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1 Lydekker. Handbook to the Marsupialia and Monotremata (1896), pp. 15, 23.

2 Owen. On the Fossil Mammals of Australia, pt. x. Phil. Trans. vol. clxvi. (1876), pl. xxvii.

3 *Ibid.*, p. 203.

4 Owen. On the Fossil Mammals of Australia, pt. viii. Phil. Trans., vol. clxiv. (1874), pl. xxi. fig. 2.

5 *Ibid*, pl. xxi., fig. 1.

6 Owen, *op. cit.* (1876), pl. xxii.

But what name should be given to the species is a little doubtful. Owen unhesitatingly referred his innominate, which came from the Darling Downs, Queensland, to *Palorchestes azael.* But Lydekker in his "Catalogue of the Fossil Mammalia in the British Museum,"[1] has declined to accept Owen's specific, or even generic determination of the great series of Macropodid bones in that collection. He says there is no reason why they should be placed in one genus more than in another. *Palorchestes* was founded on the characters of the skull, and at present there is no evidence to correlate scattered skeleton bones, except their size. Mr. Oldfield Thomas remarked during a discussion at the Zoological Society that he found dimensions one of the most useful characters in the identification of mammals. Hence there is no reason to doubt that Owen was right in assigning his innominate to *Palorchestes* rather than to *Macropus*, but as he has himself[2] remarked some species of *Procoptodon eg.*, *P. goliah* (Owen) rivalled *Palochertes* in bulk; hence size alone will not help us to separate these two genera.

The only evidence on this point is that of the teeth. A broken tooth of the Fowler's Cove specimen was collected by Mr. Hall and is now in the National Museum. Mr. Hall has identified it, no doubt correctly, as a piece of lower incisor. It is 34 mm. long, 16 mm. broad, and 7 mm. thick. In *Procoptodon* the lower incisors are subcylindrical. They have, says Owen, "a full elliptic section;" the diameters of the transverse section, according to Owen's measurements, are 6 lines (12·75 mm.) vertically, and 5 lines transversely. In *Palorchestes* on the other hand the lower incisors are spatulate. Hence the evidence of this tooth shows that the fossil cannot be a *Procoptodon*. It is, therefore, in all probability, a *Palorchestes azael*, and justifies Owen's identification of the innominate figured by him in 1876.

Accordingly the lower exposed part of the Sorrento dunes dates back to the time of the extinct giant kangaroos, the age of which is described as late Pliocene or lower Pleistocene.

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[1] Pt. v. (1887), p. 289.
[2] Owen, *op. cit.*, pt. ix. Phil. Trans., vol. clxiv. (1874), p. 800.

ART. XII.—*On the Fossil contents of the Eocene Clays of the Altona Coal Shaft.*

BY E. O. THIELE AND F. E. GRANT.

[Read 12th December, 1901.]

In a paper read by Messrs. T. S. Hall and G. B. Pritchard before this Society in September, 1896,[1] reference was made to a bore put down at Altona Bay to prospect for coal, and a list was given of the fossils met with. Their list was drawn up from the material supplied by the drill cores which was all that was then obtainable, and it was necessarily imperfect.

A shaft was subsequently sunk, and, although coal was won, the works were abandoned owing to the inflow of water. The waste tip from the sinking of this shaft is now available for collection, but is being rapidly dissipated by the tramping of stock, and by wind and rain. As the deposits passed through were highly fossiliferous, it has appeared to us desirable that a more adequate list of their contents should be published, as an assistance to a correlation of our Marine Tertiary beds.

The stratified deposits passed through before coal was reached, and their relation to one another, as judged from their position in the spoil heap, were as follows :—

(1). A coarse ferruginous grit apparently represents the uppermost part of the beds. In this we have failed to find any traces of fossils.

(2). A cream coloured sandy clay with nodules of yellow limestone occurs next. This deposit is very full of foraminifera (largely of the genus *Operculina*) and contains a fair number of brachiopods, but few gastropods or lamellibranchs. We have not included the brachiopods in our list, but they appear to be forms occurring in other typical Eocene formations.

(3). By far the largest amount of the spoil heap consists of blue and grey clays, with nodules of limestone. This material is rich in fossils, and bears a close lithological resemblance to the

[1] Proc. Roy. Soc. Vic., vol. ix. (New Series), p. 218.

deposits at Mornington and Grice's Creek, on the opposite side of Port Phillip, with which horizon its fossil contents correlate it. Out of 203 species of molluscs identified by us, only 26 (which are marked in our list with a dagger) are not included in the lists relating to the Mornington beds by Messrs. Hall and Pritchard in the last volume of this Society's Proceedings.[1]

(4) These blue clays become finally mixed with a coarse water worn quartz gravel, and cease to be fossiliferous.

We are indebted to Messrs. Pritchard and Hall for assistance in the identification of some of the molluscs and to Mr. J. Dennant, F.G.S., for naming the corals. We have also to thank Mr. Coop, of North Williamstown, for having placed at our disposal a small collection of some of the larger forms which have added a few useful names to our list.

So far as possible we are depositing the specimens on which our identifications are based (including those given by Mr. Coop) with the National Museum. Other specimens have been lodged with the Geological Museum of the University. We have in addition a very large number of other forms which we are unable to identify as named species.

Lamellibranchiata.

Dimya dissimilis, Tate.
Pecten murrayanus, Tate.
„ dichotomalis, Tate.
Amusium zitteli, Hutton.
Lima bassii, T. Woods.
Limatula jeffreysiana, Tate.
Limea transenna, Tate.
Spondylus pseudoradula, McCoy.
Modiolaria singularis, Tate.
Crenella globularis, Tate.
Nucula tenisoni, Pritchard.
„ atkinsoni, Johnston.
„ morundiana, Tate.
Leda obolella, Tate.
„ huttoni, T. Woods.
„ apiculata, Tate.

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1 Proc. Roy. Soc. Vic., 1901, vol. xiv. (New Series), part i, p. 46.

Leda acuticauda, Pritchard.
„ vagans, Tate.
† „ woodsi, Tate.
„ leptorhyncha, Tate.
Limopsis belcheri, Adams and Reeve.
„ morningtonensis, Pritchard.
† „ multiradiata, Tate.
Glycimeris laticostatus, Quoy and Gaimard.
Barbatia crustata, Tate.
„ celleporacea, Tate.
„ simulans, Tate.
Plagiarca cainozoica, Tate.
Cucullaea corioensis, McCoy.
Trigonia tubulifera, Tate.
Crassatellites communis, Tate.
Cardita delicatula, Tate.
Cardita scabrosa, Tate.
† „ tasmanica, Tate.
Carditella lamellata, Tate.
Chama lamellifera, T. Woods.
Cardium hemimeris, Tate.
Chione cainozoiea, T. Woods.
Meretrix eburnea, T. Woods.
„ tenuis, Tate.
Tellina cainozica, T. Woods.
† „ albinelloides, Tate.
† „ aequilatera, Tate.
Semele vesiculosa, Tate.
„ krauseana, Tate.
Corbula ephamilla, Tate.
„ pixidata, Tate..
Cuspidaria subrostrata, Tate.
Capistrocardia fragilis, Tate.

Gastropoda.

Murex velificus, Tate
„ rhysus, Tate.
„ eyrei, Tate.
„ amblyceras, Tate.

Murex lophoessus, Tate.
„ trochispira, Tate.
Muricidea camplytropis, Tate.
„ asperulus, Tate.
† Typhis evaricosus, Tate.
„ acanthopterus, Tate.
„ laciniatus, Tate.
Rapana aculeata, Tate (?).
Argobuccinum maccoyi, Pritchard.
Lotorium woodsi, Tate.
Lotorium textile, Tate.
† „ oligostirum, Tate.
† „ gemmulatum, Tate.
„ protensum, Tate.
„ annectans, Tate.
Colubraria tenuicostata, T. Woods.
Fusus dictyotis, Tate.
„ senticosus, Tate.
Latirofusus aciformis, Tate,
„ exilis, Tate.
„ hexagonalis, Tate.
Siphonalia longirostris, Tate.
Tritonofusus crebrigranosus, Tate.
Solutofusus carinatus, Pritchard.
Fasciolaria rugata, Tate.
„ cristata, Tate.
Latirus interlineatus, Tate.
Euthria cingulata, Tate.
„ ino, T. Woods.
Leucozonia micronema, Tate.
Phos tardicrescens, Tate.
Loxotaphrus variciferus, Tate.
Nassa tatei, T. Woods.
Voluta ancilloides, Tate.
„ hannafordi, McCoy.
„ maccoyi, T. Woods.
„ sarissa, Tate.
„ pseudolirata, Tate.
„ antiscalaris, McCoy.

Voluta strophodon, McCoy.
 „ weldii, T. Woods.
Lyria harpularia, Tate.
Mitra alokiza, T. Woods.
 „ leptalea, Tate.
 „ atractoides, Tate.
Conomitra ligata, Tate.
 „ othone, T. Woods.
Marginella propinqua, Tate.
 „ inermis, Tate.
 „ micula, Tate.
 „ wentworthi, T. Woods.
Ancilla semilaevis, T. Woods.
† „ hebera, Hutton.
 „ pseudaustralis, Tate.
Harpa lamellifera, Tate.
Columbella crebricostata, T. Woods.
Cancellaria varicifera, T. Woods.
 „ platypleura, Tate.
 „ exaltata, Tate.
 „ capillata, Tate.
 „ gradata, Tate.
† Terebra leptospira, Tate.
Pleurotoma salebrosa, Harris.
 „ trilirata, Harris.
 „ septemlirata, Harris.
 „ optata, Harris.
 „ clarae, T. Woods.
 „ murndaliana, T. Woods.
† „ samueli, T. Woods.
† „ paracantha, T. Woods.
† „ subconcava, Harris.
Bathytoma rhomboidalis, T. Woods.
Drillia integra, T. Woods.
 „ vixumbilicata, Harris.
 „ oblongula, Harris.
Cordiera conospira, Tate.
Clathurella bidens, T. Woods.
 „ obdita, Harris.

Buchozia hemiothone, T. Woods.
Mitromorpha daphnelloides, T. Woods.
Teleochilus gracillimum, T. Woods.
† Bela crassilirata, Tate.
Columbarium acanthostephes, Tate.
,, foliaceum, Tate.
,, craspedotum, Tate.
Conus cuspidatus, Tate.
,, pullulescens, T. Woods.
,, ligatus, Tate.
,, heterospira, Tate.
,, dennanti, Tate.
Cypraea leptorhyncha, McCoy.
,, eximia, McCoy.
† ,, sphaerodoma, Tate.
,, contusa, McCoy.
,, pyrulata, Tate.
Trivia avellanoides, McCoy.
Erato minor, Tate.
,, australis, Tate.
Semicassis sufflata, T. Woods.
Morio gradata, Tate.
Natica hamiltonensis, T. Woods.
,, subnoae, Tate.
,, perspectiva, Tate.
,, polita, T. Woods.
,, subinfundibulum, Tate.
Solarium acutum, T. Woods.
Heliacus wannonensis, T. Woods.
† Collonia parvula, T. Woods.
† Scala lampra, Tate.
Crossea princeps, Tate.
Turritella platyspira, T. Woods.
,, conspicabilis, Tate.
,, acricula, Tate.
,, murrayana, Tate.
† ,, tristira, Tate.
Tenagodes occlusus, T. Woods.
Thylacodes conohelix, T. Woods.

† Thylacodes actinotis, Tate.
Eulima danae, T. Woods.
„ acutispira, T. Woods.
Niso psila, T. Woods.
Chileutomia subvaricosa, Tate and Cossmann.
Mathilda transenna, T. Woods.
Cerithium apheles, T. Woods.
† Ataxocerithium concatenatum, Tate.
Newtoniella cribarioides, T.. Woods.
Triforis wilkinsoni, T. Woods.
„ sulcata, T. Woods.
„ planata, T. Woods.
Fissurellidea malleata, Tate.
Emarginula wannonensis, Harris.
Scaphander tenuis, Harris.
Ringicula tatei, Cossmann.
„ tenuilirata, Cossmann.
Bulinella aratula, Cossmann.
„ infundibulata, Cossmann.
„ exigua, T. Woods.
† „ cuneopsis, Cossmann.
Roxania scrobiculata, Tate and Cossmann
† Acteon distinguendus, Cossmann.
† „ olivellaeformis, Tate and Cossmann.
† Acteon funiculifer, Cossmann.
Semiacteon microplocus, Cossmann.
Umbraculum australe, Harris.
Limacina tertiaria, Tate.
Styliola rangiana, Tate.
Vaginella eligmostoma, Tate.

Scaphopoda.

Dentalium aratum, Tate.
„ mantelli, Zittel.
„ subfissura, Tate.

Actinozoa.

Flabellum victoriae, Duncan.
„ gambierense.
Placotrochus deltoideus, Duncan.

Placotrochus elongatus, Duncan.
Sphenotrochus australis, Duncan.
„ alatus, T. Woods.
Trematotrochus fenestratus, T. Woods.
Deltocyathus viola, Duncan.
Conosmilia elegans, Duncan.
„ anomola, Duncan.
Bathyactis lens, Duncan.
Balanophyllia armata, Duncan.
Notophyllia gracilis, Dennant.

ART. XIII.—*Observations on the Geology of Mount Mary and the Lower Werribee Valley.*

BY A. E. KITSON, F.G.S.

[Read 12th December, 1901.]

On Quarter-sheet No. 8 S.W. of the Geological Survey of Victoria, published in 1864, a prominent hill, shaped like a double horseshoe, attracts notice. This is Mount Mary, known also as Green Hill. It has an explanatory note by the late Mr. Daintree, who surveyed the area included in the sheet, which reads:—"Blocks of white and yellow argillaceous sandstone containing Miocene Tertiary fossils are imbedded in the scoriaceous lava of Mount Mary, proving the extension of the Miocene strata to this point under the lava of the plains, these being ejected blocks during the eruption."

This induced me to make a few visits to the place extending over a period of several years.

The geology of the district is interesting, and necessitates so much careful observation that sufficient information has not yet been collected to admit of any definite conclusions being formed regarding certain of the rocks occurring along the Werribee River. It is, therefore, with some diffidence that I submit these few observations, perhaps somewhat prematurely, but brought forward now as opportunities for further examination of the locality may not present themselves within a reasonable time.

On referring to the Quarter-sheet mentioned, it is seen that the whole of the area included therein, except a fringe of alluvium along the Werribee River, has been marked as of volcanic origin. These volcanic rocks comprise basalts, scoriae and tuffs, and are of considerable thickness, representing the products of several eruptions from Mounts Mary and Cotterill, and unnamed points of eruption on the east and west of Mount Mary.

The summit of Mount Mary, apparently the highest point in the locality, is somewhere about 500 feet above sea level. The mount is of more than geological interest as it is the north-

western termination of the base line from Werribee, upon which the geodetic survey of Victoria has been founded. It lies due west of Melbourne, at a distance of 24 miles in a direct line.

The shape of the mount is not quite as shown on the Quarter-sheet. Instead of the unbroken rim on the south it has a distinct sloping hollow there in addition to that shown on the north, indicating ruptures of the rim of the old crater through which the lava flowed away in both directions when the volcano was in its expiring stage. The volcanic rocks visible comprise vesicular and dense basalts of light to dark bluish-grey and drab-grey colours; reddish-brown and chocolate decomposing scoriae; and yellow and grey consolidated tuffs. Some of the scoriae weathers into brick red soil. In parts the basalt is very tough and vesicular, and contains a little hyalite; and again it is fine-grained and splinters into fragments. Some portions of the scoriae are exceedingly friable, and occasional blocks show embedded pieces and fragments of basalt. On the northern slope great numbers of masses and blocks of vesicular basalt, scoriae, and consolidated tuffs occur. Some of the latter contain pieces of originally fossiliferous clays now turned into dense rock like porcelain-jasper, and other pieces altered only to a moderate extent. An interesting feature, shown by a few small pieces found at one place, is the intimate mixture of small fragments of scoriae with the altered clays showing casts of fossils. Owing to the absence of any natural or artificial sections here the nature of the rocks forming the mass of the mount can be determined only so far as the broken blocks will admit.

The fossiliferous blocks referred to occur near the summit on the north-western and western slopes of the mount. No blocks were noticed near the foot of the slopes, the lowest found being about 175 feet below the summit on the southern side. They consist of altered clays and fine sandy and gritty clays of brown, red, grey, yellow, and white colours. There is an entire absence of carbonate of lime from the fossiliferous pieces obtained, while in one or two cases a little silica was noticed, forming a coating on the casts of fossils. In the more altered pieces the fossils have been completely destroyed so far as determination is concerned, and consist merely of badly defined

lines and blotches, indicating, apparently, the worm-like appearance of scaphopods, and the coarser stems of bryozoa. Among the less altered pieces, however, the casts of many of the fossils are still sufficiently well-preserved to admit of generic determination, and in a few cases specifically also. Doubtless, long and careful searching would disclose quite a number of determinable species.

The following list represents those sufficiently distinct to mention :—

Pteropoda.

Vaginella eligmostoma, Tate

Gastropoda.

Bathytoma angustifrons, Tate
Clathurella sp.
Cancellaria sp.
Marginella sp.
Siphonalia sp.
Murex sp.
Turritella sp.
Natica sp.

Lamellibranchiata.

Placunanomia? sp.
Spondylus pseudoradula, McCoy
Lima? sp.
Pecten sturtianus, Tate, prob.
Amussium zitteli, Hutton
Septifer? sp.
Glycimeris laticostatus, Quoy and Gaimard
Leda huttoni, T. Woods.
Trigonia subundulata, Jenkins
Cardita sp.
Corbula ephamilla, Tate?

Actinozoa.

[1] Sphenotrochus alatus, T. Woods

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[1] This Coral, of which two examples were obtained, has been kindly identified by Mr. J. Dennant, F.G.S., F.C.S., to whom I am also indebted for determining several other fossils in the list.

Brachiopoda.

Magellania sp.

Bryozoa.—Several species.

Foraminifera.—Several species.

The preceding list appears to indicate an Eocene age for the fossils, and they are herein provisionally referred to that age. This agrees with the note on the Quarter-sheet referring to them as Miocene fossils, the Miocene of the old survey being, as is now generally acknowledged by palaeontologists, either Eocene or Oligocene. There seems no reason to doubt that the beds from which these fossiliferous blocks were torn form portion of those beds of Eocene age occurring at Newport and Altona, near the western shore of Port Phillip.[1] These deposits have been proved by bores and shafts to there underlie the volcanic rocks of the Werribee plains.

On the summit of the mount, a small shallow excavation shows the occurrence of whitish clay, probably a large ejected block. This clay has evidently been used as a pigment by aboriginals as the excavation shows no evidence of being a natural one, and small pieces and flakes of the clays are found in the immediate vicinity. Along the summit also, and almost exclusively at the western end, flakes and "cores" of various rocks—both local and foreign to the locality—are fairly plentiful. The local ones comprise the ejected clays from those only slightly altered to those which are practically porcelain-jaspers. The absence at the surface of greater numbers of blocks of this rock is probably due to the fact that the aboriginals have used for their implements and other purposes nearly all the material observable on the mount. The foreign flakes are of red and white quartz, quartzites, hornstones, and the indurated sandstones which are found among the pebbly gravels of the Werribee Valley. Several hammers and axes in the rough, together with a ground

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1 "A Contribution to our Knowledge of the Tertiaries in the Neighborhood of Melbourne." T. S. Hall, M.A., and G. B. Pritchard. Proc. Roy. Soc. Vic., vol. ix., n.s. 1896.

"Report of the Secretary for Mines Victoria, for year 1894."

"Report on boring for Coal at Newport." Jas. Stirling. Prog. Rep. Geol. Sur. Vic., No. ix.

"Report on the Brown Coals and Lignites of Victoria." Jas. Stirling. Prog. Rep. Geol. Sur. Vic., No. x., pp. 80-2.

one, were found here, and numbers of pebbles of quartz, either intact, or more or less flaked. Few flakes were noticed away from the summit, or high up along the sides, thus indicating that the aboriginals used the mount as a look-out and rendezvous. It gives a most extensive view across the country in every direction, especially over the treeless Werribee Plains, and towards the Brisbane Ranges and the You Yangs.

The only trees on the mount are a few sheoaks, and an occasional lightwood, though a few eucalypts grow in the vales below, and fine specimens of them may be seen along the Werribee River, where, also, there are several other kinds of trees, conspicuous among them being the native laurel.

On examination of the natural sections, and the road cuttings at the bridge over the Werribee, one and a half miles east of Mount Mary, it is seen that at least two flows of basalt are present, separated by thin beds of tuff and lapilli; while along the river, near the sharp bend in the N.E. corner of Allot. 25B, parish of Werribee, as shown in the Quarter-sheet, a fine natural section is visible in the cliffs. The following note thereon describing this section, is as follows :—"28 feet hard scoriaceous basalt, laminated and jointed; 24 feet soft friable basalt, with hard imbedded nodules; 9 feet volcanic ash; 13 feet thin laminae of soft decomposing scoriaceous basalt; 30 feet soft friable basalt, enclosing nodules and irregular bands of augitic basalt."

These tuffs consist of a firmly cemented fragmentary rock, comprising a mass of subangular and rounded grains of sand, and fragments of basalt, scoriae, and tachylite, up to the size of grains of sand through which are distributed larger pieces of scoriae and vesicular basalt. The scoriae fragments are mostly decomposed into yellow clay.

Interbedded with these are thin bands of very fine material—volcanic dust—which forms a coherent rock, while along bedding and joint planes and exposed places, a thin crust of carbonate of lime has been deposited. This gives the rock a pretty, white appearance, noticeable from a long distance. The coherent nature of these tuffs seems to indicate that they were mixed with a considerable quantity of water prior to deposition and were not accumulations of dry material.

The sections shown by the aforementioned road cuttings are of interest, especially that on the eastern side of the river. Taking that one—which is some 420 feet long—in detail, we find the following succession, commencing at the eastern end:—

A.—Red and greyish-red soil with small pieces of decomposing basalt, and masses of greyish-white carbonates of lime and magnesia. This has a basin-shaped appearance, taking the section between the surface and the slope of the road, and in the middle is about 5 feet thick, gradually tapering off to the surface as traced west, and overlying B. Its length is about 60 feet.

B.—Dense and partly vesicular dark bluish basalt, full of blebs and patches of carbonate of lime. The rock is considerably jointed, changing, in the lower part, into laminated and nodular basalt. The material in the interstices and portions between the nodules is quite decomposed. This basalt is about 14 feet thick in the thickest part, and extends for about 150 feet along the cutting, terminating steeply near its western end, thus overlying C for nearly the whole way.

C.—Very vesicular basalt, weathering in a ragged semi-columnar manner, and greatly jointed, quite different in general appearance from the laminated structure of the immediately overlying basalt. It shows a length of about 210 feet, sloping off very gradually on the east, but more steeply on the west. It is about 6 feet thick in the middle.

The basalt in this section seems to have been derived from Mount Mary, and consists of at least two flows. The old surface of C appears to have been a very irregular one, probably due to unequal cooling of the surface of the flow, and the jutting prominences of ragged blocks torn from the parent mass.

In one or two places there are pieces of C wedged *in situ* into the lower portion of B. At the western end of the cutting the lower portion of B consists of a band of dense dark blue basalt, the upper portion of decomposing nodular and laminated basalt.

The western end of C shows the ropy structure of strained viscous lava, and at one place on the south side of the cutting a pear-shaped piece may be seen.

In the lowest visible portion the rock is a decomposing finely nodular and laminated basalt—the laminations simulating current bedding in their diverse dips. This, also, is perhaps due to strain before solidification.

On the northern side in this lowest portion is an included block of altered mudstone or clay, about 5 feet above the road level. It appears to have been torn from its original bed and carried along by the lava flow, or, on the other hand it may be an ejected block similar to those on Mount Mary. I think, however, that the former is the more probable, as the general appearance of the vicinity does not convey the impression that an old crater had existed there.

Near this included mass there is a nearly vertical thin band of hard vesicular basalt, which may be a small dyke, or a harder portion of the main flow, as, though there is a sharp break in the western side between it and the containing decomposing nodular basalt, it seems to merge gradually into the decomposed rock on the eastern side.

Section on Road on Western Bank of Werribee River.

This section runs north and south, parallel with the stream. It is only about 100 feet long. The lowest portion consists of nodular, decomposed, massively-jointed basalt, with patches of hard, vesicular basalt at the northern end, and nodules of harder basalt at the southern end. At this end it is about 28 to 30 feet thick, thinning considerably towards the north.

Immediately overlying is a bed varying from 2 feet 6 inches to 3 feet 6 inches of friable tuff and lapilli, having an uneven appearance, as if sprinkled in a dry state over a surface showing considerable inequalities, due to irregular cooling and solidification of the flow. The lapilli bed contains a great quantity of medium-sized grains of quartz, as if portions of a coarse, sandy, or gritty bed had been torn from the walls of the crater, absorbed by the volcano, and later on spread over the adjacent country, mixed with fragments of scoria and volcanic mud.

The tuff and lapilli bed has a considerable amount of carbonate of lime occurring as a coating along the bedding and joint planes. Harder and firmer vesicular basalt, very laminated in places, and considerably decomposed, rests on this bed. It runs to the surface, and varies in thickness from some 20 feet at the southern to 30 feet at the northern end.

The general appearance of these sections when viewed from the north up the Werribee gives one the impression that the flows originated at Mount Mary, as they appear to be at a slightly lower level on the eastern than on the western side of the river.

The nearest point of eruption of any size—other than Mount Mary—to this place is a hill shown in Allot. 23c, parish of Tarneit, on Quarter-sheet 8 S.E., and described thereon as a "Volcanic hill—red scoriaceous basalt." This hill rises to a height of less than 100 feet above the plain, and the summit on the northern, eastern, and southern sides shows a rising succession of fairly well-defined rims, one inside the other, of scoriaceous and partially laminated dense basalt of light and dark grey colour. On the north-western and western sides the slope is gradual and regular on to the hollow part of the adjoining plain, as if the final flow from the point had run off in this direction, while simply welling up and solidifying in that position on the northern and eastern sides. On the southern and south-western sides the slope is gradual, but along a low rise. There are present numerous aboriginal stone flakes and occasional implements and pebbles of the same kinds of rocks as on Mount Mary, with the exception of the altered clays. Of these one small piece only, of what has somewhat the appearance of this clay, was found. The absence of this rock seems to prove either the absence of these clays underlying at a depth, as in the case of Mount Mary, or that the volcanic forces here were not strong enough to break away the walls of the crater and eject such broken blocks, or even to distribute tuffs in the vicinity; thus being no more than sufficient to cause the molten rock to quietly well forth and flow away, and this even only on the north-western side.

Taking the country generally, we find that volcanic products represented by basalt, scoria, tuff and lapilli cover nearly the

whole of the district, overlain in the depressions and along the Werribee and tributary creeks by alluvium, and towards the north by pebbly drift—to be mentioned later—and a covering of varying thickness of clays of obscure origin.

The Werribee has cut for itself a deep gorge through these volcanic rocks, and though not examined the whole way from Mount Mary Bridge to that at Exford, still, wherever inspected at various points along the valley, no other deposits than those and recent drift and alluvium were noticed. The river cliffs in some places exceed 130 feet in height, and for a long way up stream from the Mount Mary Bridge beds similar in appearance and position to the tuff beds occur on the eastern side of the river, and doubtless on the western side also.

Now, turning to that portion of the Werribee Valley near Exford, the following geological features may be seen:—In the upper portion of the first gully on the western side of the river below the bridge on the Melbourne-Ballarat Road, we find a thick capping of drift, consisting of pebbles from the size of a man's head to that of a pea, mixed with gravel, sand, and large pebbles of vesicular basalt, resting on the basaltic sheet of the plains. These pebbles have probably been derived from Ordovician rocks, and comprise quartz, quartzites, indurated sandstones, etc.

As the gully is followed down towards its junction with the river, this pebbly drift is seen to occur on both slopes, and shows in small section directly overlying the vesicular basalt. It has here a thickness of something like 50 feet.

Underlying the vesicular basalt directly is a deposit of fine, sandy mudstone, of light grey and fawn colours, with a few pebbles like those seen at the Werribee Bridge at Exford—to be mentioned later. This is underlain by a sharply defined bed, 3 feet thick as far as visible, of medium-sized pebbly gravels of indurated sandstones, quartz, and quartzites. These, again, lie on dense, dark, laminated, and irregularly-jointed basalt.

The succession of rocks in descending order is thus:—

A.—Coarse pebbly drift lying on the eroded flank and surface of B.

B.—Vesicular scoriaceous basalt of the Werribee Plains containing pieces of tachylite.

C.—5 feet of mudstone, with few pebbles, underlain sharply by 3 feet of pebbly gravels. (These gravels are probably thicker, but the section precludes more from being seen).

D.—Dense, dark, laminated, and irregularly-jointed basalt, with small crystals of a glassy felspar?, showing in bed of gully where alluvium masks the surface.

I was not enabled to examine the river cliffs near here, so cannot say anything more with respect to the succession of rocks.

At the Werribee Bridge at Exford, again, in the road cutting on the western bank, the following succession is noticeable, beginning at the highest:—

A.—A few inches to 6 feet of drift consisting of pebbles of rocks similar to those referred to in the gully section.

B.—Vesicular and scoriaceous basalt, in part decomposing in laminations. Layers of white carbonate of lime occur in this basalt; also a considerable amount of white clay, containing decomposing amygdules of a brownish colour and soapy nature.

C.—Very finely sandy clays of white, brownish-yellow and reddish colours, containing fine subangular grains of quartz, and numerous small pebbles of quartz, and dense slightly vesicular basalt in the higher portion; but full of such pebbles in the lower portion.

From this point to the river level—about 30 feet below—the rock is masked by material washed down the slope, but almost without doubt basalt occurs beneath, as at the junction of Toolern Creek with the Werribee River, about 200 yards below the bridge, basalt can be seen down to the water level in the eastern cliffs.

This sandy clay has rather a peculiar appearance, and may not entirely owe its present location to transportation by water. It may perhaps be a mixture of water-transported material, and that directly derived from a volcanic source.

In the explanatory sheet of notes published with Quarter-sheet No. 12 N.E. (Bacchus Marsh), Messrs. R. Daintree and C. S. Wilkinson, who surveyed the area included therein, make the following notes:—Note 15, "Section at head of small ravine, showing 30 feet vesicular basalt, and 4 feet volcanic ash, mixed with a little white quartz sand resting on red ferruginous sand

with fine quartz pebble drift." Note 19, "A thin layer of rounded quartz pebble drift occurs here between the Miocene Tertiary and Upper Volcanic. It is probably the continuation southwards of the Older Pliocene auriferous drift underlying the basaltic tableland about six miles north of Bacchus Marsh. . . ."

These notes refer to deposits occurring in the cliffs along the Parwan Creek, some seven miles to the north-west of Exford, and they apply to a certain extent to the sections at and near Exford.

The former note quoted indicates a combined volcanic and ordinary sedimentary origin for these Parwan Creek beds as may be the case regarding the finer beds near Exford. In some places here this bed of fine material appears to have been altered by the covering basalt, being slightly hardened and of a reddish-pink colour. To test the probability of this I took a piece of the greenish-yellow rock and first roasted, then burnt it. The result was a rock very similar in hardness, colour and general appearance to that in question, which points towards its alteration by heated contact.

The surface pebbly drift may also be seen at the following places:—On the top of the flat ridge between the Toolern Creek and the Werribee River; on the top of, and stretching back from, the cliffs on the east and west of the Werribee for some distance south of the Melbourne Road; at the junction of the Bacchus Marsh and Ballan Roads in the south-west corner of Allotment 18B, parish of Mooradoranook. It probably extends along from here to the Werribee Bridge at Exford, but this portion was not examined.

It can also be seen along the railway between Melton and Bacchus Marsh, covering large areas on the north of the railway, as shown in Quarter-sheet 12 N.E. This is probably the main mass of which the portions herein specially described are the attenuated southern remnants.

We find, therefore, that the locality near the Exford Bridge shows that there are at least two flows of basalt, with an intercalated bed of pebbly drift, overlain by a thin bed of very fine gritty mudstone or clay; while overlying the upper of these two flows of basalt is a bed of varying thickness of coarse to fine pebbly drift.

This surface drift appears too extensive to be attributed to fluviatile action alone, and I am inclined to regard it as of combined fluviatile and littoral origin, especially as it shows evidence of having been subjected to a great deal of attrition, whereby all the softer rocks, such as argillaceous slates and shales, have been worn completely away, and only the harder siliceous rocks left. This refers of course to that portion of the drift which comprises sedimentary rocks foreign to the locality, thus excluding local basalts.

It would, therefore, appear as if the surface drift had been laid down along the shore of a shallow sea, the bed of which consisted of hard basalt while this basalt itself had flowed over a thin bed of coarse and fine sediments, which also had been deposited along a shore line, but in deeper water.

This suggests the probability that a shallow sea existed in the locality at a former period, in which Mounts Mary and Cotterill, as well perhaps as some other high points, stood as islands in a state of fairly energetic eruption; that their lava flows, running in a northerly and westerly direction respectively, were poured over a sea-floor, and thus were submarine flows which gradually shallowed the sea; that during cessations in eruptions or deviations in flows from these stated directions, the deposits of siliceous pebbles were brought down by a large river from the Ordovician highlands above Bacchus Marsh; that the finer sediment on the upper portions of this intercalated bed, which consists of an intimate mixture of rounded and sub-angular fine quartz grains embedded in a rather harsh, greenish-yellow clay, is possibly partly of sedimentary and partly of volcanic origin; that another lava flow spread itself over this one, advancing probably nearer to the shore line than the former one; that cessation or deviation again took place long enough for a thicker deposit of pebbly gravels to be formed; that during the whole of this time the coast line was gradually rising, and now came above the surface while the volcanic forces were gradually becoming extinct; that as the land continued to rise and the sea to recede the latter carried away the outer margin of the littoral deposits, and continued to do so at the same relative rate as the land was rising, thus precluding the probability of any patches of it being left on the normal level of the underlying basalt.

There appears to be conclusive evidence that the land around Port Phillip has risen considerably since late Tertiary times, and assuming this to be so, and, also, that the tentative theory just advanced is the correct one, the age of this pebbly drift is probably late Pliocene or Pleistocene.

ART. XIV.—*On some Features of the Ordovician Rocks at Daylesford; with a comparison with similar occurrences elsewhere.*

BY T. S. HART, M.A., B.C.E.

[Read 12th December, 1901.]

The Ordovician or Lower Silurian Rocks occupy the surface or occur at no great depths over the whole area around Daylesford. Numerous natural and artificial sections show that the rocks are much folded. The general strike is between north and north-west. Mr. F. M. Krausé[1] states that the general strike of the beds in the latitude of Wombat Hill is 16° to 22° west of north, approaching further north more and more to the magnetic meridian. In my own observations several localities further south show a strike much more to the west of north. The dip varies from 45° to vertical. The Ordovician age is indicated by the graptolites found in several localities. Mr. T. S. Hall[2] has correlated a portion of them at least with the lowest parts of the Castlemaine series.

No granitic areas or other extensive plutonic rocks occur anywhere near Daylesford.

The area to the north of Daylesford forms Quarter-sheet 16 N.E., mapped by the late Mr. Norman Taylor, and published 1893; that to the south (16 S.E.) has been mapped by Mr. S. Hunter, published 1895. I propose in this paper to notice certain minor features connected with the folding of the rocks, and to compare them with similar occurrences elsewhere.

An interesting section, presenting unusual features, is seen in the railway cutting at Italian Hill, on the Daylesford-Ballarat Railway, Quarter-sheet 16 S.E., immediately north of the lake (the lake is formed by damming the stream marked Wombat Creek on the map). There is another Italian Hill some miles

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1 Progress Report of the Geological Survey of Victoria, No. 5.

2 Proc. Royal Society of Victoria, vol. vii., New Series.

north-west of Daylesford, which must not be confused with this.

The direction of the railway cutting close to the lake is about N. 25° W., the strike of the rocks N. 40° W., dip south-westerly at 50°. The eastern or inner face of the cutting, about 40 feet high, is thus taken out almost on the bedding planes, or follows them for some distance. The outer low western bank, about 12 feet high, is a cross section of the beds, almost at right angles to the bedding, but the slight angle between the strike and the direction of the cutting allows the same beds to be seen on both sides. The railway turns a little more northerly and produces a deceptive appearance of a twist of the rocks on their strike.

A considerable surface on the inner slope parallel to the beds presents an appearance suggestive of ripple marking. A series of undulating ridges run across it, approximately parallel and nearly horizontally at intervals of 3 or 4 inches. Their upper slope is more steeply inclined to the general direction of the surface than their lower, and they are crossed obliquely, especially on their downward slope, by smaller ridges, also roughly parallel to one another and undulating. The rock is a micaceous sandstone.

Shallow curved depressions also appear, and a little further on the exposed surface of a hard sandstone is crowded with peculiar pits or pockets. These are hollows of various shapes and sizes, one, about 2 feet 6 inches across, reached a foot below the general surface of the bed. They are bounded by curved surfaces, and are generally steeper on one side, meeting the gently undulating surface of the bed, or of another pocket at a considerable angle. Often a number of the pockets are confluent. The sides of the pockets are frequently marked by curved ridges parallel to one edge and ending abruptly with the surface on which they appear. The pockets are usually empty, but sometimes filled by a softer sandstone, or by cleaved and jointed slate. Pockets filled with slate at one place form a prominent line running obliquely up the side of the cutting in a position which would correspond to the outcrop of a thin bed of slate, but the slate is discontinuous. On the opposite side of the cutting a disconnected slate patch is noticeable in about a corresponding position. The largest slate patch exposed on the east slope measured 16 inches by 12 inches, on the other side one was noticed in cross section measuring

22 by 9, the long direction roughly parallel to the beds. On the western slope also patches of softer sandstone can be detected in the sandstone. They are comparable in shape and position with the pockets, and their upper surface, sometimes at least, is also curved though not so strongly as their lower. Slate in the pockets in the sandstone is not, however, confined to the one band, others also occur, and it is probable that more of the pockets were once occupied by slate. It is said that when first exposed the sandstone in the pockets was hard. The hard sandstone in which the pockets occur softens near the surface and presents an appearance very like that in the pockets.

On the western side the chief point of interest is the form of the softer beds intervening between the sandstones. Sandstones greatly predominate at the south end of the cutting, and at first the slate beds vary slightly in thickness from point to point, the boundaries of the beds undulating and the upper and lower surfaces of the slates not corresponding. Further on, a thicker bed of slate occurs, which is very much contorted internally. At first the laminae of the upper portion are contorted and overfolded, further on a fracture crosses the bed obliquely, accompanied by a number of minor parallel fractures, all of which, as regards the laminae, present the appearance of thrust planes, but the contacts with the adjacent sandstones above and below are only deeply curved and not faulted. The result of this is a considerable thickening of the slate at this part.

In another slate bed a long wedge of sandstone is seen to project into the slate. This wedge measures about 8 feet in length on the exposed surface.

Further north there occur slate beds of very irregular character. One isolated patch of slate is of very irregular form, but with its longest diameter parallel to the beds, and a crack with slate fragments, continues in the same direction. Below it is a band of much broken slate mixed with coarse sandstone and of very irregular thickness. This continues north and takes the form of fairly continuous slate beds, with coarse sandstone between. An oblique hollow occurs in the underlying sandstone, into which a mixture of slate and course sandstone enters. The lower slate band subsequently divides, a small portion continues on its natural course for a short distance, but a more prominent oblique band

of slate crosses the sandstone, about 3 feet thick, almost to the slate bed below. The sandstones above and below this band differ somewhat in texture, and numerous apparently detached slate fragments occur below the slanting band. Following this, the sandstone is largely cut away by local faults, and a hollow formed, which is filled by a confused mass of slate and sandstone fragments, the bed above also entering the hollow and being highly contorted, this contortion extending beyond the limits of the hollow. Beyond this the sandstone seems to resume a texture similar to that before the slanting band of slate. In the southern end of the band, and the mixture which enters the hollow in the sandstone below, the appearance presented is that of a conglomerate of slate fragments in sandstone, though many of the apparently isolated fragments of slate are no doubt really united.

A number of slate fragments enclosed in sandstone can be seen in the next cutting towards Daylesford, somewhat angular in outline and up to 9 by 2½ inches in size.

At first sight the explanation might be suggested that the whole of the results might be due to deposition of somewhat plastic clay lumps with the coarse sand, accompanied by contemporaneous erosion of the underlying beds. A more detailed examination at once shows this to be untenable. One of the most conglomeratic patches is in the hollow of the sandstone below, which could not have remained open unsupported. It also fails to explain the gradual change to parallel bands of slate and sandstone. The alternative is that this is a pseudo-conglomerate, formed by breaking up of once continuous beds, and subsequent examination revealed all that was necessary to support this view.

Unequal thickening and thinning of slate beds between sandstones may be noticed in almost any railway cutting in the Ordovician rocks in this district. Slate beds are seen to be often completely interrupted on the exposed face. The variation in thickness and interruption is often connected with the jointing and other cracks in the neighbouring sandstone, and occasionally with small local faults. Sometimes the slate gradually thickens and abruptly stops at a joint or fracture in the sandstone. Contortion of the laminae is noticed in some of these cases.

The squeezing out of the slate goes so far as sometimes to show only occasional slate patches along a definite line of junction of two other beds. The connection with joints and fractures and contortion sometimes noticed, as well as the irregularity of the occurrence, indicates this as squeezing out, not thinning out.

The tendency of more plastic beds to thicken in the curves of a highly folded series and to squeeze out from the flanks of the folds is well known. If we look at the ordinary folds of the Ordovician rocks here we will find that a large portion of any bed is approximately a plane between the more sharply curved portions. If we have then a plastic bed whose thickness is comparable with the minor irregularities and small displacements of the more rigid beds alongside, it will be completely squeezed out irregularly, and patches will be left which have no passage by which they can move towards the folds, so that, in the extreme case we should expect a slate bed not to be completely squeezed into the folds, but to be represented by a number of more or less isolated remnants.

Even if no considerable area of the beds was near a plane, the boundary of the area from which the slate was removed would be irregular, and a section passing anywhere near this boundary would show more or less discontinuity in the slate.

The squeezing out would not necessarily take place especially at the places where the strata were most steeply inclined.

Again, the material of the more plastic beds is frequently seen to enter cracks in the adjoining sandstone, and this is most common when the cracks make an angle with the bedding considerably less than a right angle. By the gradual widening of this crack, either by bending of the bed or by the pressure forcing the more plastic material into it, we thus obtain a wedge of slate in a sandstone, and a corresponding wedge of sandstone in the slate. If such a wedge is cut transversely it may appear as an isolated fragment of slate in sandstone near to the main slate bed; but it may also appear as an isolated sandstone fragment included in slate. Examples of this are seen in various sizes up to that instance at Italian Hill. In an extreme case a considerable portion of a slate bed may appear as isolated fragments. As the irregular folding and yielding of the beds must result in frequent readjustments of the

strains, it may often happen that a crack which once tended to open again tends to close, and a slate fragment may be thus pinched off from the bed. Numerous cases were noticed of slate fragments isolated in sandstone, but with a crack running to a neighbouring slate bed, and to the place where such a bed might have been. Some of these may not unlikely be wedges, but some really isolated.

This method of mixing of slate and sandstone may take place wherever the cracking of the sandstone occurs, and the slate is under pressure tending to squeeze it out. It may easily occur at anticlines even, if only the packing of slate is sufficiently complete. Its final stages may appear completely conglomeratic in section.

These depend essentially on the fact that one material is more plastic than the other, and are likely to be more marked the greater the difference; hence the occurrence of the most conglomeratic appearance with the coarsest sandstone. But in a case like that at Italian Hill, when a slate is associated with a thin coarse sandstone, and all is between thicker sandstones, the mixed series will retain some plasticity even after the breaking up has begun, as long as slate is fairly continuous, hence the squeezing of the mass into the crack in the underlying sandstone. Its squeezing out between the sandstones at its south end may also be partly due to this.

In a mixed slate and sandstone series between thicker sandstones, the sandstones may be cracked across, and the slate squeezing into the cracks become continuous right across the sandstone. This may be seen both at Leveret's cutting (107 to 107½ miles), and at the big Wombat cutting (101½ to 102 miles) Ballarat-Daylesford Railway.

The direction of the longer axis of slate fragments in the sandstone is variable, the cracks which contribute to their formation may or may not belong to some regular series of divisional planes.

At Bald Hills Creek near the locality of Note 12, on Quarter-sheet 16 N.E., occur slates with interlaminated hard sandy beds to quarter-inch thick. These can be seen as regular parallel beds, then becoming variable in thickness, then as nearly or quite disconnected lenticular patches, and at places the thin beds are bent into sharp folds, and the sandy beds are often interrupted,

portions of them appearing as isolated fragments on a slaty base. But in a series in which sandstone predominates such effects traceable to contortion were not distinctly noticed.

A band of slate patches and strings passing into a continuous band of slate occurs near the above at Bald Hills Creek. The slate fragments being mostly angular this might be called a breccia, but as such isolated slate fragments more usually are to some degree rounded, and in extreme cases appear well rounded at all edges, the term pseudo-conglomerate seems preferable for the more marked development at Italian Hill, and in some instances mentioned below.

The surfaces of slate fragments enclosed in sandstone have often a satiny lustre, probably due to development of a film of sericite. This may be helped by sliding at the contact during or subsequent to the isolation of the fragment.

Conglomerates have been recorded elsewhere in the Ordovician rocks of Victoria, some of which are analogous to that at Italian Hill.

At Bendigo, Mr. E. J. Dunn[1] records the occurrence of a conglomerate "in several mines and at different horizons" of "rounded often flattish fragments of black slate, very soft, and the spaces between are filled with coarse-grained sandstone." His explanation is that the shaly material appears to have been deposited, torn up while scarcely firmer than clay and redeposited almost in situ with coarse sand. I visited the typical locality of the conglomerate at the Golden Pyke Mine It occurs close to and at an anticline. The slates are much contorted internally and contortion is also visible in some slate fragments in the conglomerate. Irregular thickening and thinning of the slates occurs, and they are frequently squeezed into cracks in the adjoining sandstones. The conglomerate is not always clearly marked off from the adjoining sandstone. The general arrangement of the slate is parallel to the bedding; both the sandstone and slate are sometimes continuous for some little distance. Sandstones greatly predominate in this part of the mine.

Near Chewton, Mr. T. S. Hall[2] describes a similar conglom-

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1 Report, No. 1, on the Bendigo Goldfield, 1892.

2 Proc. Royal Society of Victoria, vol. vii., New Series.

erate occurring in three localities. One locality is a little to the Melbourne side of the 73 mile post. The sandstone here in which slate fragments appear embedded is of coarser texture than others in the vicinity, though fine compared with what might be expected in a conglomerate with fragments of the size seen. Near the 72 mile post slate bands and fragments are again seen in coarse sandstone, the general direction of the slate being parallel to the beds, and their arrangement might at one place be due to contortion. Through the cuttings from Chewton to the Elphinstone tunnel irregular thickening of slate, sometimes at joints and cross fractures in the sandstone, interruption of slate beds and squeezing of slate into cracks were frequently noticed, and apparently detached slate fragments. At one place beds of sandstone up to 11 inches in thickness are broken and the intervening slates come together.

A conglomerate of somewhat different character occurs under the down distant signal post at Chewton. The exposed surface shows subangular and rounded sandstone fragments in a slaty paste, the slate between the sandstone sometimes shows contortion; slaty material also enters the cracks in the sandstone, the thickest sandstone bar runs for about four feet with a varying thickness to three inches, but most of the sandstone appears fragmentary. This occurrence might represent the extreme stage of contortion such as that at Bald Hills Creek, but at Chewton the sandstone is in greater proportion and contortion not so clear. It approaches closely to the other conglomerates, except that the slate predominates and appears therefore as the more continuous matrix, the sandstone appearing fragmentary.

The catalogue of the rocks of Victoria in the Technological Museum records a conglomerate of fine grained, often micaceous sandstone, enclosing rounded pieces of slate from Section 50, parish of Spring Plains, Quarter-sheet 13 N.E. I find no note of this on the Quarter-sheet, but oblique lamination of slates and sandstone (to be referred to later) and contortion are frequently recorded near this point and elsewhere on this sheet.

On Chinaman's Creek, north-west of Castlemaine, Quarter-sheet 14 S.E., a note records fragments of slate embedded in a surface of sandstone.

In the railway cuttings south of Creswick were noticed isolated slate patches, probably due to both causes of squeezing out and pinching off. Wedges of slate projecting into sandstone were also noticed.

Quartz was noticed associated with these conglomerates at the Golden Pyke Mine and near Elphinstone tunnel, but not affected by the breaking up. It is clearly of subsequent date.

Conglomerates are also recorded in the Ordovician Rocks at several patches near Lauriston, where the note probably refers to some overlying rock, the areas being outlined, but not coloured differently to the Ordovician.

At Coimaidai there is a true conglomerate of small extent described by Messrs. Officer and Hogg.[1]

On the Keilor Plains, Quarter-sheet 7 S.E., several bands of conglomerate are noticed. These are true conglomerate, but their Ordovician age is not certain.

An analogous mixing of beds of different character is noticed by Professor David and Mr. Pittman near Tamworth, N.S.W. "Though as a rule the tuff beds are regularly and evenly interbedded with the radiolarian clay shales, instances are not infrequent where these rocks are confusedly intermingled together." A reproduction of a photograph shows disturbed masses of radiolarian shale enclosed and entangled in a thick bed of submarine tuff. The two views figured are described as "laminated and contorted Radiolarian chert in submarine acidic Tuff" and "Radiolarian chert with submarine Tuff crushed into them."[2]

Mr. Pittman describes certain conglomeratic rocks at Lyndhurst[3] in which the included fragments of claystone are exceedingly angular, and appear to be the remains of claystone which have been intruded and broken up by the tuffaceous matrix through which they are now scattered. The disturbance is ascribed to injection of steam and other gases.

The breccia from Maldon, in the Technological Museum, is clearly due to brecciation of a rock subsequent to its formation.

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1 Proc. Royal Society Victoria, vol. x., New Series.
2 Q.J.G.S., lv., 1899.
3 Records G.S. N.S.W., vol. vii.

An appearance of ripple marks has been before noticed as occurring at Italian Hill. Ripple marking is also seen at Bald Hills Creek in the sandstone, and at Jim Crow Creek, below Spring Creek, in a series of slates in which faulting parallel to the beds has occurred on three different beds.

"Ripple marks" have been frequently noticed in the Ordovician Rocks of Victoria.

I find only one mention of ripple marks on the Quarter-sheets, near Metcalfe (13 S.E.) "nearly vertical contorted mudstone and shales, some of the beds are ripple marked." Oblique lamination and cross-grained sandstone (to be referred to below) are also noticed near here.

Ripple marks are described by Mr. Dunn as common at Bendigo at many localities, and horizons, and regarded as true ripple marks.[1]

Mr. T. S. Hall, however, referring to similar occurrences at Castlemaine, suggests that there and at Bendigo they are the result of crumpling during folding.

Mr. C. C. Brittlebank[2] says of the rocks at the Werribee Gorge, "contortion and pseudo-ripple markings are well developed, the latter appear more extensively in localities which have been subjected to the greatest strain and pressure."

Mr. G. W. Lamplugh, writing of crush conglomerates in the Isle of Man, says:—"Where packing has taken place, the lines of stratification are confused in a series of wrinkles, which emerge on the bedding planes, as small parallel folds closely resembling ripple marks;" to these he applies the term pseudo-ripple marking.[3]

Mr. E. R. Faribault, of the Geological Survey of Canada, describing saddle reefs in Nova Scotia, where, however, the folding has not proceeded nearly so far as at Bendigo, states, "the corrugations and crumplings are more pronounced in the slate and quartz, and owe their origin to the sliding of thick beds of quartzite over one another, between which the softer bands curve and buckle in a wonderful manner."[4]

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1 Report on Bendigo Goldfield, No. ii., 1896.
2 Vic. Naturalist, vol. xviii.
3 Q.J.G.S., li.
4 Austr. Mining Standard, Oct. 29, 1899.

We may notice also that in the Daylesford cuttings joints occasionally show a somewhat wavy surface in sandstone (in slate they are much smoother) and that there is a slight rippling of the surface of the pockets at Italian Hill.

A consideration of the effect of the crumpling on the junction of two dissimilar rocks will lead to the conclusion that it is highly improbable that such a surface, if originally even, should remain so at any place when packing has taken place in one of the rocks, and the inequalities would be likely to assume some linear arrangement, as the folds within the crumpled bed do. The fact that the main ridges of the apparent ripple marks at Italian Hill are nearly parallel to the strike agrees with this.

At Daylesford, Bendigo and Chewton, and probably at most other places, in the Ordovician rocks in Victoria the evidence of movements and packing in the slates is so definite and widespread that the existence of apparent ripple marking has an adequate explanation in this, and is, at least, no evidence of original ripple marking.

The pockets in the sandstone at Italian Hill do not appear to be a common feature. They can be seen also in the by-wash of the Lake, where some might at first sight be mistaken for potholes, but their form is easily recognised and they are revealed by slight slipping in the solid bank. They are probably in the same beds as appear in the cutting. They are also seen at the north end of Leveret's cutting and at the Breakneck, north of Hepburn, and possibly at Chewton.

It is possible for sand to be deposited with an extremely uneven surface in rough water (as I noticed in sludge from sluicing deposited among rocks in Jim Crow Creek), but here there is no evidence of such currents and the edges of the pockets are too definite. The band of slate fragments filling some of them suggests that they are the hollows which have once been occupied by the fragmentary remnants of a squeezed-out slate bed, but others contain sandstone and are not on any evident line of a slate bed. If, however, a slate bed were to be squeezed into isolated patches the neighbouring sandstones being at places in contact this would tend to the production of very irregularly distributed strains in the sandstone, and hence might set up irregular curved fractures and irregular consolidation.

producing different weathering. The surfaces of the pockets do not differ from the sandstone any more than is common in joint surfaces and other fractures in such sandstone. At Leveret's cutting in one pocket a banded arrangement of strings of quartz and limonite was noticed, but here the whole rock was irregularly traversed by such strings, and at the typical instance at Italian Hill no concretionary action was noticed.

The sandstone beds at many localities contain a series of more or less undulating and usually discontinuous thin bands of fine grained material containing mica. Sometimes these are nearly parallel to the stratification, sometimes nearly parallel to the cleavage or to joints. In the large railway cutting near Wombat, a stepped junction with the neighbouring slate bed is noticed, as if a slight slipping had taken place on these planes. Near here it is possible to get clear observations of dip of strata, cleavage, these micaceous bands, and three sets of joints. These bands here agree most nearly in direction with one set of joints.

At Bald Hills Creek they are well developed, and form the "oblique stratification" mentioned in the note to the Quarter-sheet. The junction with the neighbouring argillaceous beds on both sides is somewhat indefinite, and the sandstone between them turns and forms lenticular patches in these beds nearly parallel to their general direction. They are parallel in several sandstone beds, but afterwards change their direction. Mr. N. Taylor's sketch shows the actual point at which the change takes place, which, however, I did not see. That they are not really stratification is clearly seen by their relation to the next beds, and their great regularity of development would also be against current bedding.

South of Creswick in a railway cutting they are well developed, standing out somewhat in the friable sandstone (probably owing to the mica flakes giving them some firmness, though soft). Here they may be seen to curve considerably and become less definite on approaching the slate beds from one side, but on the other side they continue unaltered to the slate. Their direction is near that of the cleavage.

Mr. E. J. Dunn notices a similar structure at Bendigo under the name of "fissuring," and regards it as a coarse development

of cleavage.[1] He ascribes the finer material to the rubbing together under great pressure of the opposite faces of the "fissure," and the difference of direction from the cleavage he regards as "probably the result of torsion in the sandstone." A radial arrangement around the anticlines and synclines is noticed, and the fact that movement has taken place on these lines is seen by the notched boundary with the slate. One side of such notches I noticed to be often parallel to the "fissuring." But at the Golden Pyke Mine, where it and the cleavage are well developed, I noticed no corresponding change of cleavage direction with the change of direction of the "fissuring" round the anticline.

An exactly similar arrangement is well marked at Chewton, with the same notched boundary of the slate. It is described by Mr. T. S. Hall as jointing. I noticed it well developed at two synclines between Chewton and the tunnel. Its strike is about the direction of the syncline, and it is not affected in its radial arrangement by the fact that the axial plane of one of these synclines is considerably inclined.

At another place in these cuttings similar lines were seen in a direction more nearly horizontal than vertical.

The same structure is probably referred to by the term "oblique lamination," used by Mr. Norman Taylor in Quarter-sheets 13 N.E. and S.E. I do not find it noticed on the other Quarter-sheets. These surfaces, then, appear to have no constant relation either to the cleavage or jointing. The finer material on them might result from crushing or from grinding, the arrangement of the mica flakes being in the one case at right angles to the pressure and in the other parallel to the motion. But their discontinuity in most cases and their curved form, sometimes pronounced, agree best with crushing under pressure. Their regular arrangement at the anticlines and synclines, and their variable development, both in direction and degree of definiteness and continuity, seem more likely to be connected with the distribution of the strain within the individual beds than with the forces acting on the mass as a whole. If the strata were being folded under the pressure of superincumbent

[1] Report on Bendigo Gold Fields, No. II.

strata, both anticline and syncline might crush under their load as arches, and produce radial surfaces of crushing, unless the packing of the argillaceous beds were sufficiently rapid to prevent it.

In the straighter portions of the folds the direction of the pressure might approximate to that of the general pressure; that is, these surfaces might approach the cleavage direction, or it might tend to be at right angles to the beds, in which case these surfaces would approach the direction of stratification.

The fact of actual movement on these surfaces in many cases would then be the the result of yielding by slight slipping on planes of weakness already established. Their curving to the slate beds, as at Creswick, would probably be due to a yielding by a viscous shear along these more plastic beds. At Bald Hills Creek both of these have very likely taken place, and this may contribute to the abnormal strike 13° east of north, though further north, at a short distance, where this structure had disappeared, a normal strike N. 11° W. had been resumed.

The series of phenomena described all seem to indicate that in examining the effects of folding on a mixed series of rocks of different character due attention must be given to the differences of rigidity and probably compressibility of the different beds, and their manner of yielding under the strains to which they have been subjected.

Art. XV.—*On Some New Species of Victorian Mollusca, No. 5.*

By G. B. PRITCHARD and J. H. GATLIFF.

(Plates IX., X.).

[Read 12th December, 1901].

The present paper includes descriptions and figures of the following species:—

Mangilia (?) incerta, sp. nov.
Terebra inconspicua, sp. nov.
Leptothyra arenacea, sp. nov.
Calliostoma hedleyi, sp. nov.
Haliotis granti, sp. nov.

We have to thank Mr. S. W. Fulton for photographs of some of the species, and Mr. F. E. Grant for the drawings of the remainder.

Mangilia (?) incerta, sp. nov. (Pl. IX., Fig. 1).

Shell small, narrow, somewhat solid, fusiform, composed of five and a half slightly convex whorls, with a well impressed suture. Embryonic portion consists of a whorl and a half, smooth and slightly swollen from the dorsal aspect, and apparently with an exsert tip.

The penultimate and spire whorls relatively strongly ornate, with close narrow costae traversed by a few strong spiral threads; on the penultimate whorl itself there are twelve or thirteen costae which are broader than the interspaces, and there are about five spiral threads, the median one being the coarsest.

The costae gradually fade out on the body whorl, but there are numerous (about fifteen) more or less irregular spiral threads, the strongest being situated at about the shoulder.

Aperture elongate-ovate, a little less than half the length of the shell, with a very broad anterior canal; columella smooth, slightly excavated medially, and with a gentle twist towards the anterior end.

The shell is of a uniform light brown colour.

Dimensions.—Length, 4 mm.; breadth, 1·5 mm.; length of aperture, 1·75 mm.; breadth of aperture, ·5 mm.

Locality.—Off Rhyll, Phillip Island, Western Port, obtained from shell-sand dredgings (J. H. Gatliff).

Type in Mr. Gatliff's collection.

Terebra inconspicua, sp. nov. (Pl. IX., Fig. 2).

Shell small, not solid. of 9½ whorls, regularly and tapering. Apex blunt. Nucleus of 1½ smooth whorls. Whorls telescopically arranged, slightly convex with numerous faint ribs crossing the whorls at almost regular intervals, the only other sculpture being faint transverse striae, visible under the lens. Suture well-defined, and on account of the overlapping of the whorl a slight shouldering is caused. Colour sordid white, irregularly, longitudinally streaked with brown.

Dimensions.—Length, 12 mm., greatest breadth, 3·5 mm.

Locality.—Dredged five to six fathoms off Rhyll, Phillip Island, Western Port (J. H. Gatliff).

Observations.—This shell may be readily distinguished, owing to its slight sculptural characters.

Type in Mr. Gatliff's collection.

Leptothyra arenacea, sp. nov. (Pl. IX., Fig. 3).

Shell small, turbinate, solid, umbilicate, whorls four to five convex, the two nuclear whorls smooth, the rest spirally ridged, these ridges being well-developed and numbering about eleven to thirteen around the mouth on the last whorl; space between the ridges wider than the ridges, aperture circular. Umbilicus deep, and extends at the back of the columella to the anterior of the aperture, and is occasionally margined by a strong thread. Base round. Lip thick. Sordid white.

Dimensions.—Diameter, 2 mm.; height, 2 mm.

Locality.—Dredged 5 to 6 fathoms off Rhyll, Phillip Island, Western Port (J. H. Gatliff).

Type in Mr. Gatliff's collection.

Calliostoma hedleyi, sp. nov. (Pl. IX., Fig. 4).

Shell conical, imperforate, apex acute. Whorls eight, convex, often tumid below the suture on the lower whorls, suture well-defined. Embryonic whorl smooth, the sculpture on the two following whorls is clathrate, and on the remainder consists of spiral, irregularly granular threads, of unequal size, and varying in number, usually six on the antepenultimate, and by the gradual division of some of them, increasing to eight on the penultimate whorl, and twelve on the body whorl above the periphery at the outer lip, and there are from twelve to sixteen on the base, these latter are often spotted with red on alternate threads, granulations on base flattened, space between threads narrow.

Base convex, umbilical region narrowly impressed. Aperture subrhomboidal. Outer lip thin, smooth inside. Inner lip, pillar oblique, smooth, rounded, somewhat excavately flattened at its base from within, not toothed.

Colour, yellowish-brown, with reddish markings, either in maculations or spots.

Dimensions of Type.—Diameter, 14 mm., height, 15 mm., other specimens measuring, 14 by 17 mm., and 14 by 12 mm.

Locality.—Dredged 5 to 7 fathoms off Rhyll, Phillip Island, Western Port (Gatliff); San Remo, Puebla Coast, Airey's Inlet, Lorne, Portland (Maplestone).

Observations.—As in many other Trochids the sculpture in this species varies considerably. By Australian conchologists it has generally been wrongfully identified as Trochus fragum, Phillipi, but reference to the original description and figure show that species to be a more acutely conical shell, with flatter whorls and larger granules. We agree with Mr. C. Hedley in his remarks at page 19 Proc. Lin. Soc. N. S. Wales, 1901, that T. fragum is a synonym of T. decoratus of the same author, the latter name having priority. Hitherto we have not found this species on our coast.

We have named the shell after Mr. C. Hedley, Conchologist to the Australian Museum, Sydney, as it is greatly owing to his critical remarks above referred to that we have been prevented from following the errors of others.

Type in Mr. Gatliff's collection.

Haliotis granti, sp. nov. (Pl. X.).

Shell strong, broadly ovate.

Dorsal aspect.—Spiral portion of the whorls well defined and elevated. Body whorl somewhat flatly convex, and from the outer lip, for about one-half of the whorl, radiately ruggedly ridged; ridges following the contour of the lip, and being six or seven in number; these are crossed by numerous irregular, comparatively fine, spiral ridges, which are closely scaled. Perforations strongly produced, tubiform; five open, and another half formed on the lip. The perforated ridge is followed outwardly by a broad concave area, then there is a well defined ridge, having on its under side two minor ridges; base sharply angled.

The spire is white, with irregular radiating bands of brown, with green shading, which gradually coalesce; the outer portion of the body whorl being of a uniform dull olive brown.

Basal aspect.—The inner lip is somewhat broad and concave; and from about its centre to the outward termination gradually tapers off in width.

The iridescence of the nacre is richly tinted, the predominating colours being rose and green.

Dimensions.—Greatest diameter, 140 mm.; smallest diameter, 110 mm.; altitude, 43 mm.

Locality.—Shoreham Beach, Western Port (J. H. Gatliff).

Observatcons.—This species in broadness of form and tubular production of the perforations is allied to H. cunninghamii, Gray, but is more rugged in sculpture, excepting in the spiral ridges, which are finer. It is nearly related to H. naevosa, Martyn, but is much broader, the spiral whorls are more elevated, the body whorl flatter and the projections of the perforations are much larger; the base of the inner lip tapers more gradually, and it is broader from the columella outwards; and the coil of the shell is more circular; the iridescent coloration is very much richer.

Type in Mr. Gatliff's collection.

We have much pleasure in naming this shell after Mr. F. E. Grant, who has assisted us in our work by his skilful drawings of many of our new species.

DESCRIPTION OF PLATES.

Plate IX.

Fig. 1.—Mangilia incerta, n. sp.
„ 2.—Terebra inconspicua, n. sp.
„ 3.—Leptothyra arenacea, n. sp.
„ 4.—Calliostoma hedleyi, n. sp.

(All much enlarged).

Plate X.

Haliotis granti, n. sp. × 2.

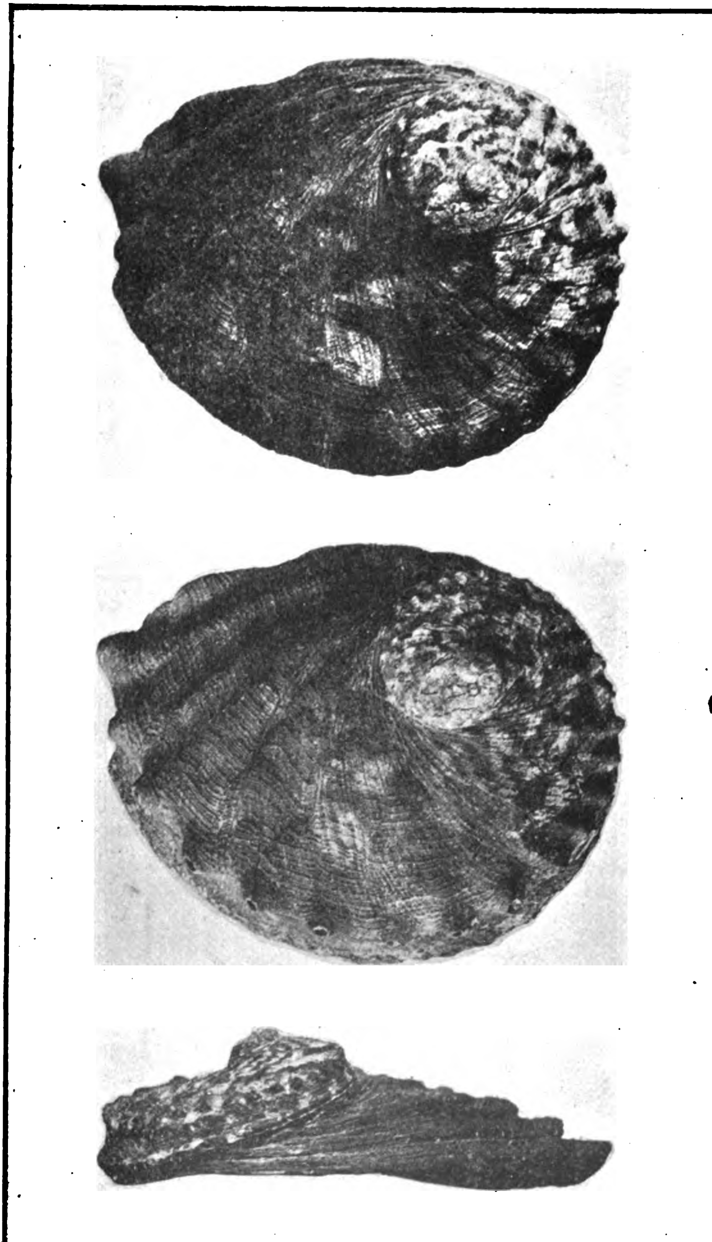
(About half natural size).

1

2

3

4



ART. XVI.—*The Geology of Mount Macedon, Victoria.*

BY J. W. GREGORY, D.Sc., F.R.S.,

Professor of Geology in the University of Melbourne.

(With Plates XI.-XVII.).

[Read 18th July, 1901].

I.—Introduction.

Mount Macedon is an isolated mountain ridge which, though seen at a distance of 40 miles, is one of the most conspicuous features in the views from Melbourne. Its hummocked crest

rises abruptly from the broad basalt plains at its foot; and its outline stands boldly on the skyline above the level plains and dissected plateaux, which combine with it to form the northern and western rim of the great Melbourne basin.

The interest of the appearance of Mount Macedon is heightened to a geologist by the uncertainty as to its age and structure expressed on the maps of the Geological Survey of Victoria. The rocks are described as "Trap or Hypogene," and in the official geological handbook to the State, its age is suggested as probably late Palaeozoic, though on admittedly inadequate grounds.

This uncertainty is unfortunate, for a short acquaintance with the geology of the Melbourne area shows that Macedon is one of a series of similar igneous blocks, whose age and stratigraphical relations must be determined before the volcanic history of Victoria can be satisfactorily written.

In my first visit to Mount Macedon I had the privilege of the guidance and company of Mr. H. R. Hogg and Professor Spencer. I have also to express my thanks for much assistance in a subsequent visit to Mr. H. J. Grayson, who has prepared the photographs of the rock sections, as well as the sections themselves. I am indebted to Professor Orme Masson and Mr. R. J. Lewis for analyses of two Macedon Rocks; to Mr. H. C. Jenkins, A.R.S.M., for the analyses of allied rocks from the Dandenongs and Blacks' Spur; and to Mr. A. Everett for some advice as to the geographical nomenclature. Mr. E. T. Prior, of the Mineralogical Department of the British Museum, has very kindly examined some rock sections and given me the benefit of his opinion on some doubtful points, which is of especial value owing to his careful study of the allied rocks of Abyssinia.

II.—The Geographical Features.

Mount Macedon was discovered by Hume and Hovell in 1824. They saw it from Mount Disappointment, and named it Wentworth, after the distinguished champion of Australian liberty. The mountain was, however, first visited by Sir Thomas Mitchell, during his memorable journey from Sydney through Australia Felix. He ascended the mountain on 30th

September, 1836, in order to connect his route in northern Victoria with the southern coast. From the summit he saw Port Phillip, and, neglectful of Hume and Hovell's priority, he adopted for the mountain a new name suggested by that view. Mitchell explains, "I gave it the name of Mount Macedon with reference to that of Port Phillip" (12, vol. ii., p. 283). He adds that "Geboor is the native name of this hill, as since ascertained by my friend, Captain King, and is a much better one."[1]

Mount Macedon consists geographically of one long ridge, which on the west, south and north rises abruptly from the surrounding country. The ridge stands on a platform of Ordovician rocks, which are exposed beneath the Macedon series on all sides except the north-west. There, according to Aplin's map, the "traps" sink below the basalts of the "upper volcanic series"—the "Pliocene" basalts of the Geological Survey.

The "traps" of the Macedon group are represented on the survey map as covering an approximately rectangular area, the sides facing the cardinal points. The margins, however, are irregular, as inlets of Ordovician rocks are exposed on the floor of the deeper valleys. The main Macedon ridge runs obliquely across the area from the south-western corner to the eastern side. It is about five miles long and has three main summits. The name of Mount Macedon is often restricted to the south-western shoulder of the main ridge; this point is marked by the cairn of the Trigonometrical Survey. The height is 3325 feet. To the north-east of the trigonometrical station the crest descends slowly; it rises again to a central hummock, known as the Camel's Hump.[2] Hence the ridge descends again to another saddle, rising slightly to the eastern shoulder, the third conspicuous point in the view from Melbourne. The eastern shoulder is less abrupt than the south-western; beyond it a lower ridge continues towards the the east, where Macedon ends at the peak of Mount Eliza.

The northern face of the ridge is steep and comparatively unbroken. The southern side is a long slope, which has been

1 This name is given as a synonym on Arrowsmith's Map of S.E. Australia. Parl. Pap. Gt. Brit., 1852-3, vol. xvi., p. 97.

2 The exact height of the Camel's Hump is doubtful; it is generally regarded as slightly higher than the south-western shoulder.

cut by a series of deep valleys into several spurs running southward from the main ridge. The most westerly of these spurs begins at the Camel's Hump and lies between the Turritable Creek to the west and the Willimigongong Creek to the east; it may be called the Upper Macedon Spur, as that village is situated upon it. The second spur is on the eastern side of the Willimigongong, and its most conspicuous feature is its southern shoulder, Mount Towrong (2820 feet); it may be called the Towrong Spur. Eastward again is the valley of Baringo Creek. Then follows the third spur, which leaves the main ridge at the height of 2720 feet at "Mahoney's Corner" and runs through Cherokee's to Mount Robertson; it may be called the Cherokee Spur. The eastern side of this spur is formed by the "Running Creek," a small stream which rises near Kerr's Mill, and flows through a gap between Mount Teneriffe to the south and Mount Charlie to the north, and joins the Bolinda Creek. These two hills are capped by Kerrie conglomerates and geologically are not part of the Macedon group. To the north of them is Mount Eliza, which forms the eastern end of the main ridge.

On the plain to the north of the main ridge are several hills, which belong geologically to Mount Macedon. They are the Hanging Rock; Dryden's Hill or the Jim-Jim, north-west of Newham; Brock's Monument, north-east of the eastern shoulder; and several unnamed hillocks. The ridge south of Mount William is mapped as "Hypogean Trap" on the Geological Survey maps, but the rock in question has no connection with the Macedon series.

The general topography of the mountain, with the nomenclature adopted, is shown on the accompanying shetch map (Fig. 1). The nomenclature of the peaks is somewhat confused, but I have adopted the names used locally. The Camel's Hump is marked as Mount Diogenes on the parish map and on the Geological Survey map, whereas on the Index map of the Geological Survey the name Alexander's Crown is apparently given to this peak. The Hanging Rock is called Mount Diogenes on the parish map of Newham, Dryden's Rock and the Hanging Rock being given as synonyms. The name Dryden's Hill is now generally accepted for the ridge to the north-west of Newham Hotel; it is thus marked in the county map of Dalhousie. This hill is also known as the Jim-Jim.

Brock's Monument is named Alexander's Head on Skene's[1] Map of Victoria and the Index map of the Geological Survey,

III.—Geological Literature on Macedon.

The list of geological literature on Mount Macedon is brief. The first reference is that of Mitchell, according to whom the mountain is formed of "syenite so whitened with the weather as to resemble sandstone."[2]

The next important contribution to the geology of the mountain is the map prepared by C. d'O. Aplin under the direction of Dr. A. R. C. Selwyn (1). This map, which is on the scale of two inches to the mile, shows the boundaries of the Macedon igneous rocks, but gives little information as to their relations and variations. The whole series is represented by one colour, and is described as "trap or hypogene"; a note on the Camel's Hump states that the rock there is a porphyritic felspar trap, while the rock of the south-western shoulder (the Mount Macedon of the map) is said to be a non-porphyritic felspar trap. The only interruption in the area of the "traps" is the occurrence of a granite dyke on the western flank of the mountain.

After the publication of the Geological Survey Map, brief descriptions of some of the Macedon rocks were given in Selwyn's Catalogue (No. 19, pp. 12, 13, 65, 94, 95). The rocks of the Camel's Hump, the Hanging Rock, Brock's Monument, and the eastern flank of Macedon were all classed as plutonic rocks and were named "felspar porphyry." The most important information about the Macedon rocks given in this Catalogue is an analysis of the "Camel's Hump" rock, which is returned as having the high soda percentage of 10·17. The interest of this determination was, however, apparently overlooked.

In 1894 there was a proposal partially to adopt Mitchell's original name for the Macedon rock; for Cosmo Newbery, in his "Descriptive Catalogue of Victorian Rocks" (15, p. 26), described Brock's Monument as composed of syenite porphyry containing hornblende and very glassy looking orthoclase.

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[1] Everett's Edition of Skene's 8 miles to the inch Map. Surv. Geol. Vict.

[2] The determination of the rock as syenite is due to Lonsdale. Cat. Aust. Rocks in Coll. Geol. Soc., Parl. Pap., Gt. Brit., 1852-3, vol xvi., p. 433. Lonsdale also determined the rock at the base of the north side of the mountain as a "decomposed gneiss."

In 1895 Mr. R. A. F. Murray (14, pp. 22-23) accepted the name of syenite porphyry and advanced the view that this rock is intimately associated with the granites which occur below it.

The last contribution to the geology of Mount Macedon is a paper by Mr. E. G. Hogg (5, pp. 93-96), in which the rocks of the Turritable Creek waterfall, the Camel's Hump, the Hanging Rock and Brock's Monument are determined as trachyte. Hogg expressed the opinion that the age of the Macedon rocks is almost certainly post-Silurian, and probably later than the Permo-Carboniferous, owing to their absence from the glacial conglomerates of that period.

IV.—The Petrography of the Macedon Rocks.

Most of the Mount Macedon ridge is covered by gum forest, thick scrub, and a mantle of deep, rich soil. Rock exposures are scanty and small; accordingly a detailed geological map is impossible, and the determination of the relations of the various rocks by field evidence is disappointingly difficult. Hence it will be convenient to reverse the normal order of procedure, and describe the petrography of the Macedon rocks before dealing with their relations in the field.

The igneous rocks of Mount Macedon may be divided into six groups:—

1. Grano-diorites
2. Geburite-dacites
3. Trachy-phonolites
4. Sölvsbergites
5. Andesites
6. Agglomerates and Ashes.

The rocks of the last five groups are those properly belonging to Mount Macedon; the association of the rocks of the first group is accidental, as they belong to the underlying Palaeozoic platform.

The following descriptions of the rocks are limited to features of geological significance. An account of the mineral constituents I hope to issue subsequently.

1. The Plutonic Rocks of the Palaeozoic Platforms.

Aplin's map marks the occurrence of three outcrops of "granite" in the Macedon area. The largest exposure lies along the south-eastern border of the Macedon series. An outlier occurs to the north of this main outcrop, and it also is on the boundary between the eruptive rocks and the Ordovician. The third exposure is low in the western slope, where a "granite" dyke is marked two and a half miles east-south-east from Woodend.

The south-eastern "granite" is well exposed on a ridge crossed by the road from Riddell's Creek to Cherokee's. The rock continues from the State school reserve at Mount Teneriffe on the south, to a low saddle half a mile south of Cherokee's. The rock is also well exposed on the ridge between the head of Kerr's Creek, (or Running Creek) and the Cherokee Road.

The rock, as Aplin remarked, varies considerably in character. A specimen from the ridge three-quarters of a mile south-west from Kerr's Mill, at the head of Running Creek, shows the following characters. The rock is of medium grain and holocrystalline. It consists of quartz, plagioclase and biotite. The quartz is in large blebs and some idiomorphic crystals; some of them have solidified before the biotite. The plagioclase is mostly oligoclase and belongs to two periods of consolidation; the crystals often consist of a worn, decomposed nucleus, restored by re-growth with the outer zones in optical continuity with the central part. The material of the nucleus has decomposed into an irregular granular aggregate, with numerous minute microlites of zoisite.

Biotite is usually abundant; it occurs in large well defined crystals, and in microliths, some of which occur in zones round the idiomorphic crystals of quartz and plagioclase.

The specific quartz of this rock is 2·8.

As a second example of the rock forming the south-eastern plutonic outcrop may be taken a specimen from the south-western margin at Hamilton's. The quartz is somewhat more abundant, but is all allotriomorphic. The predominant felspar is oligoclase, mostly occurring in irregular aggregates. There are also some larger, simply twinned felspar grains referable to orthoclase. The biotite at this locality is often decomposed into chlorites.

In some varieties of the rock from this plutonic mass hornblende is present, and it sometimes wholy replaces the biotite. The hornblende occurs in patches, in some of which it is fairly abundant. In the rock as a whole, however, the presence of hornblende is exceptional.

This plutonic rock was mapped by Aplin as granite, an identification supported by Selwyn, who described (19, p. 7, No. 51) it as a "binary granite." But the rock is allied to the diorites by the abundance of plagioclase and the scarcity of orthoclase. It is a typical member of that series of Vicorian plutonic rocks that have been described by Howitt (*e.g.*, 7, p. 31) and accepted by Rosenbusch (17, vol. i., p. 231) as quartz-mica-diorites. The rock is sometimes a quartz-amphibole-diorite.

The rocks of this series differ from the typical European quartz-mica-diorites, *e.g.*, that of the Val Camonica, in the nature of the felspar. The alkali felspar is far more abundant than in the true diorites, which are characterised by the predominance of the basic felspar. The Victorian rocks are intermediate between the normal granites and diorites. We may therefore conveniently adopt for them the name of grano-diorite, which has recently been widely used in America for the similar rocks of the Sierra Nevada.

The preceding description of this grano-diorite is necessary, because a passage from it to the "traps" of the Macedon series has been generally maintained. Murray, for example, states (14, pp. 22, 23) that "in all these instances [*i.e.*, Macedon, Dandenong, and Healesville] there seem to be no clearly defined lines of demarcation between the rocks classed as trap and the adjacent granites, while in some places a gradual passage from one to the other, as regards mineral composition, is observable, and the different forms appear to blend with one another as though they were simply rocks of varying mineralogical structure belonging to the same general mass."

However, I could find no trace of passage from the plutonic to the eruptive rocks. Half a mile south of Cherokee the two rocks can be seen close together. Both present their normal characters up to the junction. The comparatively coarse grained quartzose rock underlies the compact dark green Macedon rock, and neither Mr. Grayson nor myself could find any intermediate variety.

The relations of the two rocks can be best explained by the Macedon rock covering the surface of an older plutonic rock.

Petrographically there is nothing especially to connect the grano-diorites and the rocks of the Macedon eruptive series. Most probably the grano-diorite was intrusive into the Ordovicians, and is simply part of the old Palaeozoic platform. The grano-diorite, therefore, belongs to a much earlier period than the Macedon eruptions.

This view, however, would be refuted if Aplin's map be correct as to the "granite" dyke on the western flank of the mountain. This dyke is marked as running from the south-eastern corner of allotment No. 22, almost due south-east toward the summit of the south-western shoulder of Macedon. The dyke is 2½ miles east-south-east from Woodend. In a short search for this granite I failed to find any plutonic rock; but, in what appeared to me the corresponding position, is an unusually coarse-grained variety of the Macedon dacites. The occurrence of a granite dyke cutting through the traps would certainly prove that the "granites" (in Aplin's sense of the term) were later than the Macedon eruptive rocks. But, unless I failed to find Aplin's dyke, the rock has no connexion with the grano-diorites exposed on the eastern flanks of Macedon.

2. The Rocks of Mount Macedon Series.

The rocks of the Macedon series may be divided into five groups: (1) a series of hypersthene-dacites, which for reasons related on p. 202 are described as geburite-dacites; (2) trachy-phonolites; (3) sölvsbergites; (4) alkaline-andesites; (5) agglomerates and ash.

a. The Geburite Dacites.

The main bulk of Macedon is formed of a fine-grained rock which, when fresh, is tough and varies in colour from dark green to black speckled with grey or pinkish spots. The rock weathers brown or pinkish-red. Examined microscopically the rock shows two main varieties; the first ranges in structure from granulitic to pilotaxitic; the second variety is hyalopilitic.

As types of this series of rocks we may take the following:—

1. Willimigongong Type.

Neighbourhood of Upper Macedon.

(a) Willimigongong Creek, near junction with the Ordovicians; opposite Cheniston (No. 25).

This rock is seen, when examined microscopically, to be porphyritic, consisting of well developed, abundant phenocrysts in a hypidiomorphic, granulitic base. The phenocrysts consist of plagioclase and pyroxene.

The plagioclase phenocrysts are usually irregular and corroded; but in some the outline is regular and the angles are sharp. The twinning is coarse and is on the albite type, often combined with the carlsbad type. Zonal growth is commonly shown, but no undulose extinction. Basal cleavage fragments show extinction of 22° on the edge 001/010; but in one case the extinction angle was 28°; hence the plagioclase phenocrysts include members of the bytownite series.

The pyroxene phenocrysts are mostly of hypersthene, which shows the typical pleochroism. The mineral is abundant and often has regular crystal outlines. The crystals are smaller than the larger bytownites. A few corroded crystals of monoclinic pyroxene occur.

Ilmenite is abundant and occurs in well developed crystals, often as large as the hypersthenes.

The base of the rock is partly a granulitic mosaic of felspar and quartz and partly a pilotaxitic mixture of the same constituents. The separation of the two minerals in the granulitic patches is difficult, but the presence of quartz is shown by the uniaxial character of some of the granules. The larger plagioclase microliths show simple or multiple twinnings, and have straight extinctions. The majority are oligoclase. Small biotite crystals occur in zones around some of the larger felspars in the base, and some of it is scattered irregularly through the base.

An analysis of this rock is given on page 201. The specific quartz is 2·78.

(b) Cheniston. On the south-eastern slope of Mr. H. R. Hogg's house at Macedon is an outcrop of a similar rock. The base is granulitic; there is no trace of fluxion structure; plagioclase laths in the base are scarce. The phenocrysts are more crowded than in the rock previously described; they include quartz in small corroded crystals. Biotite is more abundant and is often altered to chlorite.

(c) South of the Schoolhouse. A rock (No. 26) similar to the last variety occurs a couple of hundred yards south of the Upper Macedon schoolhouse.

(d) Mount Towrong Spur. The rock exposed along this Spur agrees in the main with the Willimigongong variety, but has more crowded phenocrysts and more abundant quartz. The rock at the summit of Mount Towrong has many broken phenocrysts with the angles of the fragments sharp and unworn. The quartz contains many apatite needles; the ilmenite is in large hexagonal plates. The hypersthenes are often deeply corroded by the granulitic base.

This spur ends to the north in a platform beside the source of the Willimigongong south of the Camel's Hump. A branch track runs eastward to Lady Carnarvon's Tree from the main track between the Creek and the Camel's Hump. The rock exposed near the junction of the two tracks has several interesting features. Parts of slides cut from it appear almost brecciated from the abundance of angular, fragmentary phenocrysts. The hypersthenes are large and include plagioclase microliths. The ilmenite is sometimes surrounded by an aureole of biotite. Some of the larger biotites are partially altered to chlorite. The base is granulitic, and has no trace of fluidal structure.

(e) North face of Macedon. The Willimigongong type may be seen at many localities on the north face, especially around Braemar; at the foot of the north-

eastern buttress and along the road between the last-named point and the foot of the ridge south of the Hanging Rock.

A variety of the dacites intermediate between the Willimigongong and the merocrystalline types occurs at the southern end of the Upper Macedon Spur. It is exposed on the slope between Mr. H. R. Hogg's house, Cheniston, and the Willimigongong. The rock is holocrystalline and porphyritic with phenocrysts of plagioclase and hypersthene, and some quartz. The base under a low power in ordinary light appears glassy with an incipient fluidal structure due to the banded distribution of minute greenish microliths. The largest of these microliths are hypersthene; the remainder are probably also hypersthene, but they are too small to show pleochroism or admit of certain identification. The rest of the base is doubly refracting and consists of a felt of plagioclase laths with granules of quartz and plagioclase.

The main difference between the Cheniston and the Willimigongong types is that the former shows a passage from a granulitic to a pilotaxitic structure.

A second representative of this type is the rock (38) at Cherokee's, near the junction with the grano-diorites. In this case an incipient fluidal structure is due to the flakes of biotite. This mineral also occurs in radial tufts around the ilmenite and is more abundant than in most of the Macedon rocks. The base is granulitic, passing in patches to pilotaxitic.

2. *The Cheniston Type.*

Associated with the granulitic Willimigongong dacites is a rock that weathers light brown and greyish, and then appears tuff-like, owing to the occurrence of angular felspar fragments in a light earthy base.

As an example of this rock may be quoted that exposed on the roadside by the entrance to the carriage drive at Cheniston.

When examined microscopically this rock is seen to have a hyalopilitic structure. The phenocrysts are irregular aggregates of bytownite granules and of corroded isolated crystals of the same material. The hypersthene has been altered and is stained

with limonite. Chlorite is present as an alteration product after the hypersthene. The base has a well developed fluidal structure shown by the arrangement of the plagioclase laths; it contains patches of material of an earlier consolidation in which the structure is pilotaxitic or subgranulitic.

Hence this rock agrees in composition with the Willimigongong type and began to solidify under the same conditions; but its final consolidation occurred after it had undergone a definite flow.

b. The Trachy-Phonolites.

The rock (No. 28) that crosses the valley of the Turritable Creek and forms the waterfall a little to the west of the State school at Upper Macedon is the most convenient type of the trachy-phonolites.

The rock is dark green in colour, and is porphyritic, with large phenocrysts of anorthoclase, showing the typical minute twinning of that species. The base is full of fluidally arranged felspar laths, which are either simply or repeatedly twinned. They also are probably anorthoclase. Sparsely scattered through the rock are small crystals of aegerine, which show the typical pleochroism of green and greenish yellow; they are about as long as the longer felspar laths in the base. Between the laths is a somewhat altered green glass, which in places is arranged in vermiculitic growths and elsewhere occurs as radial globules, which show a black cross under crossed nicols. An isotropic mineral, which gives some hexagonal sections, and the green glass both give gelatinous silica when treated with hydrochloric acid. Evaporation of acid that has acted on this mineral. Mineral yields a few gypsum crystals, so that it is no doubt nosean. Ilmenite in large flakes is sparsely scattered, but in places it occurs in clots.

This rock has been analysed by Mr. R. J. Lewis; the analysis (No. 2, p. 201) in conjuction with the microscopic evidence shows that the rock is a trachy-phonolite.

Another exposure of this rock (No. 33) occurs in a small quarry to the south of the waterfall and near the junction with the underlying Ordovicians. The rock is porphyritic and hyalopilitic in structure. It contains phenocrysts of anorthoclase

showing marked undulose extinction and extremely fine twinning. Some green glass, a little nosean, and abundant ilmenite also occur. The fluxion structure is well developed and there are a few vesicles filled with green-stained silica.

c. The Sölvsbergites.

The third member of the Macedon rock series forms the Camel's Hump and two outliers in the plain to the north.

The rock of the Camel's Hump is the best known geologically, as it was analysed by Newbery, and is the type of the "felspar porphyry" or "syenite porphyry" of the Geological Survey.

The rock is greyish brown in colour, and consists, in the main, of large phenocrysts of anorthoclase, set in a fluidally arranged series of lath-shaped felspars, which may be either soda-sanidine or anorthoclase. Some of the phenocrysts have been fractured, and the edges are quite sharp and uncorroded; hence the rock probably became thick and semi-viscous before consolidation, and has not flowed far from its vent. In the interspaces between the felspars are mossy patches and groups of small crystals of aegerine and riebeckite. The aegerine is more abundant and occurs in larger crystals than the riebeckite; the latter is, however, conspicuous from its fine blue colour and strong pleochroism.

Similar in form to the riebeckite, but in smaller and rarer patches, is a dark brown to opaque mineral, which Mr. Prior has kindly identified as cossyrite. It is strongly pleochroic and the grains are angular or subangular.

The rock on the southern side of the Camel's Hump is somewhat fresher. The aegerine, riebeckite and cossyrite, though minute, are often idiomorphic; but in places these minerals are moulded on the felspars. Ilmenite, including small zircons, occurs. The biotite is sometimes intensely corroded, and some zones have been changed to chlorite.

The Hanging Rock, which rises from the plain at the northern foot of the Macedon ridge is closely allied to the rock of the Camel's Hump; but the fluidal structure is less defined. The felspar laths of the ground mass tend, moreover, to occur in short broad prisms rather than in long laths. The interspace between the felspars is occupied by a granular felspar mosaic.

Aegerine is abundant in small angular grains and prisms, which are crowded round the anorthoclase phenocrysts. The riebeckite is in larger crystals than in the rock of the Camel's Hump.

Nosean, in corroded crystals and biotite, also occur, though sparingly; the crystals of the latter are fringed with aegerine prisms.

d. The Andesites.

On the plains to the north and north-west of Mount Macedon are occasional exposures of weathered rock containing numerous black specks in an earthy grey base. The best exposure is in a small quarry on a hillock in allotment No. 84 in the north-eastern corner of Woodend. The rock is included on the Geological Survey Map as a member of the Cainozoic basalts. As, however, the rock (No. 35) contains anorthoclase, some altered nosean and altered olivine, it is a member of the Macedon series and not of the later basalts. I have not yet succeeded in getting fresh specimens of this rock, and postpone a fuller account of it until better material is available.

e. Agglomerates and Ashes.

Exposures of pyroclastic rocks are rare on Mount Macedon. Denudation has probably removed most of them, and what remain now occur in depressions between the more resisting dykes and lavas.

The best example of agglomerates that I have yet found occurs at Upper Macedon on the roadside leading from the lodge at Government Cottage to Mr. Justice Hood's house near the State Nursery. The best section is at the height of about 400 feet above the Turritable Creek and a little below some land that belonged to the late Sir F. McCoy. Here occurs a band of agglomerates with blocks of the geburite-dacites up to 4 feet in diameter included in fine ash. Further up the road is an exposure of volcanic ash traversed by a ten-foot dyke of geburite-dacite.

Well developed tuffs occur in other parts of the Macedon range, as *i.e.*, at Cherokee.

V.—Chemical Composition.

Three analyses of the Mount Macedon rocks have been prepared. The sölvsbergite from the Camel's Hump was analysed by Newbery. By the kind permission of Professor Orme Masson, analyses of the Willimigongong dacite and the trachy-phonolite of the Turritable Waterfall have been made by Mr. R. J. Lewis in the University Laboratory. The analyses are given on page 201. For comparison with them are given analyses of dacites from Dandenong and the Black Spur, and of a granodiorite, also from Dandenong, for which I am indebted to the Government Metallurgist, Mr. H. C. Jenkins, A.R.S.M. To Dacia Doelter's analysis of the latter is quoted in column No. 13 show the differences between the geburite-dacite and the dacite of In comparison with the trachy-phonolite of the waterfall may be quoted vom Rath's analysis of the rock from Scarrupata in Ischia.

Prior's analysis of a sölvsbergite from Abyssinia is given in column No. 11.

	Macedon.					2 Miles N. of Dandenong Township.							
	Sölvsbergite, Camel's Hump.	Trachy-phonolite, Turritable Waterfall.	Geburite-Dacite. Willimigongong.	Dandenong Dacite.	Black Spur Dacite.	Porphyrite.	Porphyrite.	Grano-diorite.	Grano-diorite, Omeo.	Orthophyre, Omeo.	Sölvsbergite. Eddi Gijorgis, Abyssinia.	Trachy-phonolite. Scarrupata, Ischia. vom Rath.	Dacite. Doelter.
	1	2	3	4	5	6	7	8	9	10	11	12	13
SiO_2 -	65·97	62·72	64·38	67·25	65·80	64·0	65·05	63·38	65·59	69·04	63·74	65·75	66·32
Al^2O_3 -	18·11	16·27	13·62	16·38	16·87	19·11	10·04	17·36	17·46	18·14	17·86	17·87	14·33
FeO -	4·82			1·30	1·08	2·80	5·14	1·98	·10		·30	4·25	·25
Fe_2O_3 -	trace	6·83	9·17	4·62	3·97	2·22	8·47	1·61	4·21	·53	4·27		5·53
FeS -						1·58	1·35	3·38					
MnO -				·33	trace						·19		
CaO -	·98	1·06	1·99	3·05	3·16	5·13	4·80	4·18	1·03	·44	·83	1·33	4·64
MgO -	trace		2·18	1·76	1·76	2·17	trace	1·80	2·35	·27	·10	·52	2·45
K_2O -	trace	4·99	3·51	1·36	2·54	·14	·02	·31	2·89	5·10	5·19	3·48	1·61
Na_2O -	10·17	8·47	6·28	2·56	3·45	1·12	3·39	4·07	4·10	7·12	7·23	5·67	3·90
H_2O -	·56			·30	1·05 (H₂O and CO₂)	1·01	·56	·54	1·98	·35	·83 (H₂O and CO₂)	·78	1·13
CO_2 -				1·56		1·71	1·53	1·13					
	100·61	100·34	101·13	100·47	99·68	101·19	100·35	99·74	99·71	100·99	100·54	99·65	100·16

VI.—The Relations of the Macedon Rocks.

After the foregoing account of the rocks of the Macedon series, we may proceed to consider their general petrographic relations. In the first place it is clear that the rocks, excluding the grano-diorite, are part of one petrographic series, having been formed by differentiation from one magma. They all belong to the intermediate group, and are characterised by a high percentage of soda. The three rocks that have been analysed vary from 62·7 to 65·9 % of silica, and from 9·79 to 13·46 % of alkalies. The soda varies from 6·28 % in Mr. Lewis's analysis of the Willimigongong rock to 10·1 % in Newbery's analysis of the rock of the Camel's Hump. The microscopic examination, showing the predominance in the superficial member of the series of anorthoclase, aegerine, nosean, riebeckite and cossyrite (aenigmatite), agrees with the chemical analysis, and shows the abundance of soda in the rock.

That the grano-diorites are not members of the Macedon series is shown by the absence of passage rocks, and of the typical minerals of the Macedon group from the diorites. The Macedon effusive rocks are not those that would have been formed by eruption from the grano-diorites that underlie them on their south-eastern margin. The plutonic representative of the Macedon lavas is probably a nepheline-diorite, which has not been found in Victoria.

The member of the Macedon series which originated at the greatest depth is the Willimigongong type of dacite. It occurs in big intrusive dykes or masses along the Willimigongong, at Cheniston, Towrong, Braemar, Cherokee, etc.; in fact wherever denudation has cut at all deeply into the Macedon block.

The microscopic examination of this rock at first suggests for it the name of hypersthene-andesite, as hypersthene and a fairly basic plagioclase are the two most striking constituents. The abundance of free quartz in some sections, however, necessitates its inclusion among the dacites. The term hypersthene-dacite would, however, alone be inadequate. The facts that the rock is holocrystalline and that it occurs in intrusive dykes are not final objections, for Rosenbusch accepts (17, vol. i., p. 450) a group of holocrystalline dacites. The most serious objection is

that the normal dacites contain an excess of alkaline earths over alkalies, and far less alkali than the Macedon rock. Thus Doelter's analysis of the typical Dacite of Transylvania gives 66 % of silica, 7·1 % of lime and magnesia, and only 5·5 % of soda and potash. The Macedon rock contains 64·3 % of silica, 4·1 % of lime and magnesia, and 9·8 % of soda and potash. A comparison of the mean molecular composition of the dacites quoted by Loewinson Lessing (11, p. 449) with that of the Macedon rock is shown by the following table, which also gives the nearest analysis to the latter.

—	SiO_2	Al_2O_3	Fe_2O_3 and FeO	CaO	MgO	K_2O	Na_2O
Dacite (mean of twelve analysis	1·123	0·158	0·042	0·068	0·035	0·020	0·071
Willimigongong Creek	1·086	0·133	0·057	0·035	0·054	0·037	0·101
Teolo, Euganean Hills	1.111	0.137	0·079	0.029	0·003	0·034	0·127

In Rosenbusch's series of analyses of Dacites, no rock is given with so high a percentage of alkalies as we find at Macedon. In his sixteen analyses (18, p. 286) the highest percentage of soda and potash together is 7·95, in the rock to which he gives the precise but lengthy name of "quarzbiotithronzitaugitporphyrit"; the highest percentage of soda is 4·06 against 6·28 in the rock from Willimigongong.

The name dacite alone is unsuitable, for the dacites are eruptive members of the quartz-diorite group and this Macedon rock is certainly part of a sequence of which the best developed lava is a member of the tinguaite group. The name, moreover, would be locally inconvenient, for normal dacites appear to be extensively developed in Victoria, and it would be inadvisable to include the two rocks under one name. Hence I propose to refer to the fundamental rock of the Macedon range as geburite-dacite, Gebur being the native name of Mount Macedon.

The geburite-dacites may be defined as intrusive or effusive dacites, distinguished from the normal dacites by the rarity of quartz and the great excess of alkalies, especially of soda. The

predominating structure of the ground mass is granulitic; hypersthene is the most abundant ferro-magnesian constituent.

The typical geburite-dacites form thick dykes. The effusive rocks of Macedon may be divided into four main groups. The first is the geburite-dacite, with hyalopilitic structure, such as occurs around Cheniston. The second group may be called trachy-phonolites; they are characterised by the abundance of anorthoclase, and the replacement of hypersthene by aegerine; they probably also occur as dykes. The rock at the Turritable Waterfall is the best type of this group. The rocks of the next group are hyalopilitic with well developed fluxion structure. The minerals are anorthoclase, riebeckite, cossyrite and aegerine, and the rocks may be identified as sölvsbergites. Newbery's chemical analysis of the Camel's Hump rock agrees with that of the typical sölvsbegites.

To the last rock of the Macedon series I feel at present doubtful about applying a definite name, not having secured a fresh specimen. The rock is exposed in a shallow quarry at the north-eastern corner of Woodend. It was included by Aplin among the basalts of the Newer Volcanic Series. The rock is no doubt more basic than the other members of the Macedon series, for it contains what appears to be altered olivine. The rock may be left for the present as an alkali-andesite.

The rock sequence at Mount Macedon, therefore, ranges from holocrystalline dykes of geburite-dacite to a series of effusive rocks including trachy-phonolite, sölvsbergite and alkali-andesite.

The order of the minerals in this rock sequence is well marked. The geburite-dacites contain abundant hypersthene, and some corroded phenocrysts of bytownite. In the trachy-phonolites the hypersthene has been replaced by aegerine, and the basic plagioclase by anorthoclase. In the sölvsbergites the abundance of soda is expressed by the development of the riebeckite and cossyrite in addition to the soda minerals of the trachy-phonolite. The last stage in the series is marked by the occurrence of what is probably altered olivine in the andesites of the northern margin of the Macedon series.

The foreign rocks most nearly allied to those of Macedon are not found among the dacites, but in the series of rocks from the Kristiania district made famous by Brögger's searching investi-

gation. The Macedon sölvsbergites, though resembling those of Southern Norway, have not been derived from the same magma. The Kristiania sölvsbergites have been formed by differentiation from laurdalite, a plutonic rock composed of anorthoclase, cryptoperthite, elaeolite, lepidomelane, and a monoclinic pyroxene. In spite of the very varied series of rocks that has been developed from the laurdalit magma, it does not include any equivalent of the soda-hypersthene-dacite, which is the lowest exposed rock at Macedon.

A second series of allied rocks occurs in Abyssinia. The rocks have been described in a valuable paper by Mr. E. T. Prior; but these rocks are said to be a dyke series, and there is no close ally of the geburite-dacites.

VII.—The Geological Structure of Mount Macedon.

The dense forest growth that covers Mount Macedon obscures the mutual relations of its rocks. Nevertheless, by piecing together the evidence of many parts of the area the general arrangement can be determined.

The best idea of the structure of Mount Macedon can be obtained by a traverse north and south across the ridge from the township of Macedon on the south over the Camel's Hump and thence through Hanging Rock to the village of Newham on the north.

In such a traverse we find the first exposures of igneous rocks on the northern side of a branch of the Saltwater River and to the north-east of Macedon cemetery. Here the geburite-dacites rest on the Ordovicians. The igneous rocks are exposed in a small quarry, in occasional hummocks in the forest, and in the bed of the Turritable and Willimigongong Creeks. The dacites have a well-developed fluxion structure where they rest on the Ordovicians; but in the main mass of the eruptive rock the structure is holocyrstalline and granulitic. On the lower slopes of this part of Macedon there are dykes of trachy-phonolite and geburite-dacites; but the field relations of these dykes are not clearly shown. Continuing the ascent towards the main ridge we pass over some agglomerate and ash traversed by dykes, and then over thick effusive masses, as well as some apparently

intrusive bands of geburite-dacites. On the platform immediately south of the Camel's Hump there are exposures of geburite-dacites of the Willimigongong type, upon which rests the hummock of the Camel's Hump sölvsbergite. This rock is jointed and weathers spheroidally. It appears to be part of a sheet that flowed southward. But there is no trace of the vent, for the rock is abruptly cut off by the steep northern face, which, below the sölvsbergite, consists of geburite-dacite. At the foot of the northern face is the valley of the Five Mile Creek; the floor is covered by alluvium. Beyond this is the Hanging Rock, a hill of sölvsbergite, which rises 360 feet above the surrounding plain. The rock is very coarsely jointed and is in places irregularly columnar; it has been worn into great hollows by the ready decomposition of the soda silicates and the removal of the insoluble residue by the wind.

The Hanging Rock is probably part of a sheet discharged from a vent a little to the south; but the vent may be hidden under the site of the hill. North of the Hanging Rock is a plain of andesite, which in places rises into hills such as the Jim Jim or Dryden's Hill. The andesite is covered in places by the basalts; and the line of demarcation between these rocks is indefinite, although the country is open. The apparently intimate field relations of the Macedon andesites and the basalts suggests that there is no very great difference in age between them.

It was from the supposed great antiquity of the Macedon rocks that they were called "traps." According to Page's[1] definition, the word "is now employed by geologists to embrace all the multifarious igneous rocks that belong to the Palaeozoic and Secondary epochs, as distinct from the more ancient granites on the one hand and recent volcanic rocks on the other."

It was apparently in this sense, and not in the original meaning of a number of sheets of igneous rocks forming a succession or steps (*trappa*, a step), that the word trap was adopted by the Victorian Survey; for the English Survey thus used the term in its work in North Wales, where Selwyn received so much of his training.

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1 Page, Handbook Geological Terms, 1865, p. 442.

The Macedon rocks were therefore called traps, because they were regarded as forming a palaeozoic plutonic massif; although it was recognised that their aspect was not typically plutonic.

The theory that Mount Macedon is a plutonic massif is disproved by the absence of contact metamorphism and of disturbance in the adjacent Ordovician rocks. There are traces of contact alteration in the district; but they may be due to the intrusion of the grano-diorites. In several places the Ordovician rocks may be seen close to the junction with the Macedon series. Yet there is neither contact alteration nor disturbance of strike; and both changes must have happened had so great an igneous mass as Macedon been directly intruded into a series of sediments.

The relations of the geburite-dacites to the underlying Palaeozoic platform may be illustrated by the two following cases:

1. *Upper Macedon Spur.*

The Macedon township ridge which lies between the Turritable and the Willimigongong Creeks, ends to the south below a band of alluvium along one of the western branches of the Saltwater River. On the northern bank of this stream the Ordovicians can be seen outcropping below the geburite-dacites and trachyphonolites. The sedimentary beds can be traced along the southern margin of the Macedon rocks and up the courses of the Willimigongong as far as Cheniston, and for a short distance along a branch of the Saltwater a little to the west of the Turritable Creek. The Ordovician beds show no contact metamorphism and their strike is not disturbed. The junction of the sedimentary and igneous beds along the south is from the level of 1600 to 1625 feet. On the eastern side of the Macedon township ridge the Ordovician beds run further to the north to a height of 1940 feet in the "Knoll" near Cheniston.

The relations of the two rock series show that a lobe of geburite-dacite has flowed quietly southward from a vent to the north over an irregular surface of the Ordovicians.

This conclusion is in agreement with the evidence of other parts of the Macedon margin. A mile and a half to the east of the Hanging Rock is an inlier of the Ordovicians running along

the continuation of the north-eastern buttress of the main ridge. The Ordovicians outcrop here as denudation has exposed the summit of an old ridge of grits and sandstones. The Ordovicians are flanked on both sides and on the south by geburite-dacites; on the sides the dacites are at a lower level than the Ordovicians (Fig. 3.) At the northern end of this inlier the Ordovicians are covered by a boss of basalt which forms a bare hump (2200 feet high) crossed by the main road between paddocks Nos. 9 and 17 on the parish map of Newham.

The Ordovician rocks are neither altered nor disturbed by the dacites.

The relations of the two series may be best explained by a flow of dacites from the south having buried a meridional ridge of Ordovicians.

The evidence of these two cases shows that Mount Macedon is not a plutonic massif. The second explanation that suggested itself was that the mountain might be a laccolite, a view supported by the apparent absence of tuffs and the general form of the igneous mass. I could find no definite evidence in favour of this view, and finally the discovery of beds of pyroclastic rocks traversed by dykes show that this explanation was unnecessary.

This evidence leaves no doubt that Mount Macedon is the worn stump of a great volcano. There is no trace of a crater, and the superficial beds of ash have been removed by denudation. The fragmentary material was probably never very abundant, for lavas formed most of the volcanic pile. Like the phonolite domes of Europe, the richly alkaline lavas of Macedon probably welled forth quietly with only occasional explosions. The eruption therefore formed a dome-shaped hill of lava with but few interstratified ash beds. The first eruptions were of geburite-dacite, which forms the main mass of the mountain. The sölvsbergites and trachy-phonolites were then discharged from secondary vents on the flanks and probably also from the main crater. The soda-andesites of the north-western flanks were then erupted. Finally the Macedon eruptions ceased and the volcanic forces found vent in the discharge of the basalts that now cover the surrounding plains.

The section (Fig. 4) shows a transverse section across Mount Macedon; but owing to the denseness of the forest and scrub only a diagrammatic section is at present possible.

The original crater must have been far above the present summit of the mountain, which may once have risen 5000 feet above the underlying Palaeozoic platform. It is now only the basal stump of a volcano, in which all traces of the crater have been lost, but which has not yet been sufficiently dissected to show the rock of the central core.

VIII.—Allied Eruptive Centres in Victoria.

Before considering the place of Mount Macedon in the volcanic history of Victoria it will be convenient to refer to the distribution of allied igneous rocks in the State.

Rocks rich in soda are widely distributed here both in time and place. Mr. Howitt has described (6, p. 38) an orthophyre from Omeo with 7·12 % of soda; the rock is assigned to the middle palaeozoic.

Petrographically the Victorian rocks most closely related to the geburite-dacites are some dykes traversing the Ordovician beds at Bendigo. They were originally described as limburgites, and have been referred by Mügge to the monchiquites. I have not been able to see the slides described by Mr. Howitt, from the 180 Mine; but some dykes collected at the Eaglehawk Mine are monchiquites, though in places rendered abnormally acid by the infiltration of secondary silica. The only certain fact as to the age of these dykes is that they are post-Ordovician; but Mr. Howitt has suggested that they are in all probability connected with the Cainozoic basalts. Petrographically it is probable they are of the same age as the Macedon eruptions.

The Victorian rocks with which the Macedon series is most allied geologically are the great eruptive masses of the Upper Yarra and the southern tributaries of the Goulburn. The masses in question are formed of dacites and constitute the mountains of Dandenong, the Cerberean Range, the Blacks' Spur, near Healesville, and possibly an independent centre between Mount Arnold and Warburton.

A description of a few of these rocks will illustrate their affinities to the Macedon series.

Mount Dandenong consists of a hypersthene-biotite-dacite. The quartz is more abundant and occurs in larger phenocrysts than in the geburite-dacite. Biotite is also more abundant. Hypersthene occurs in large corroded phenocrysts, and there are rare crystals of augite. The predominant felspar is apparently andesine. The base is granulitic. I have not found any trace of aegerine or riebeckite in this or any other of the Dandenong rocks examined. An analysis prepared by Mr. Jenkins shows that the rock is normal in alkalinity. This rock appears to form the main mass of the Dandenong hills, and it is associated with tuffs of the same mineral composition.

The Blacks' Spur, between Healesville and Narbethong, is another dacite dome. A specimen from the summit of the ridge has been analysed by Mr. Jenkins, and the results show that the rock has a very similar composition to the Dandenong dacite. The microscope shows that the petrographic characters are practically identical.

At the northern foot of the Blacks' Spur the dacites rest on grano-diorite. In order to test whether there be any passage rocks between the two, I have examined the rocks nearest to the junction that I could find.

A small quarry at the bend of the road close by the gateway to Mr. Lindt's house, the Hermitage, is the most convenient type of the dacites near the grano-diorites. The rock is much decomposed. It consists of abundant quartz phenocrysts, which are deeply embayed by the ground mass; there are numerous flakes of biotite altered to chlorite, and of a pyroxene broken up into chloritic aggregates. The base is a weathered glass, which shows well marked fluxion structure. That the rock was flowing in a thick viscous condition is indicated by the fragments of fractured crystals remaining close together.

The rock is a weathered lava and is in no way intermediate between the dacite of the summit of the Blacks' Spur and the grano-diorite.

The Cerberean Range is also composed of dacite. I have only been able to examine the north-western edge of this mountain; but there it consists of dacites resting on an irregular surface of

the Silurian and apparently also on the Cathedral sandstones. The rock is marked on the Survey Map as granite. But it is merocrystalline, and the base shows well marked fluxion. Quartz is abundant, and so also is biotite. There is no hypersthene. The felspar in part shows the minute twinning of anorthoclase.

In this respect, as in some others, the Cerberean rock is more nearly allied to the Macedon than to the Dandenong dacites. But, speaking generally, the dacites of the Upper Yarra and the Upper Goulburn differ from those of the geburite series by their lower alkalinity and the absence of the minerals riebeckite, aegerine, and nosean.

These different dacite masses appear to have similar stratigraphical relations. The Dandenongs, for example, rise above the plain of the Yarra as Macedon rises above its Palaeozoic platform. The dacites have not metamorphosed the sedimentary rocks which they overlie. For instance, the Silurians can be seen close to the dacite near the landslip on the road from Mooroolbark to the summit of Dandenong; the Silurian rocks appear quite unaltered.

It is true that in some places the Silurians are altered near the junction with the dacite; but there is no proof that it is the dacite that has wrought the change. It is more likely that the alteration has been caused by intrusions of grano-diorites and porphyrites, which have been injected into the Palaeozoic series.[1]

Mr. Ferguson has stated[2] that there is a gradual change from the "granites" to the "Dandenong traps"; but I have failed to find evidence of this, and Mr. T. S. Hart, who examined the sections on the Gembrook railway, tells me that wherever the two rocks could be seen together they were both greatly decomposed. He says there was no sign of a passage between the two rocks. This evidence is consistent with the view that the diorites and the dacites belong to different dates and had independent origins.[3]

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1 Mr. Victor Stirling, it should be noted, has suggested that the alteration of the Silurian rocks at Lilydale is due to the traps. (No. 21, p. 10.)

2 He states (3, p. 58) that where the trap and granite join "the one rock merges into the other without a break, the granite gradually getting more and more trappean in character till one rock gives place to the other."

3 Since the paper was read I have examined the sections in question, and agree with Mr. Hart's conclusions.

Mr. Stirling (20, p. 29) may also be quoted in support of the view that the Dandenong rocks, which he calls mica-diorites, are much later than the underlying plutonic rocks.

IX.—The Age of Mount Macedon.

The stratigraphical evidence as to the age of the Macedon volcano is very incomplete. It was post-Ordovician; and it was earlier than the adjacent basalts, which belong to some part of the Upper Cainozoic. That is all that the available evidence positively proves.

The Geological Survey have regarded the mountain as Palaeozoic. But as Mr. E. G. Hogg has remarked (5, p. 96), no fragment of the Macedon rocks has been recognised in the glacial conglomerates of Bacchus Marsh and Heathcote. This negative evidence suggests that Macedon is later than the glacial series, which at the earliest is Upper Palaeozoic.

The thick Kerrie conglomerates which occur on the south eastern flanks of Macedon are considered by Mr. Hart (9, p. 66) to be probably earlier than the glacial series. No fragments of the Macedon rocks have been found in these beds, so that the dacites are probably later than the Kerrie conglomerates.

The only Cainozoic rocks with which the Macedon series is in contact are the basalts.

Mr. Knox, M.H.R., tells me that it has been suggested that some of the deep leads at Malmsbury originally flowed southward over the present site of Mount Macedon. I know of no direct evidence which renders this view either probable or impossible. The suggestion, however, is of interest, as showing that its author understood that Macedon is not a plutonic mass, and that it is not of Palaeozoic age. If this hypothesis be correct then Macedon is later than the beginning of the deep lead series of Central Victoria, and is at the earliest, according to current terminology, of "Miocene" age.

At present we can only conclude that Macedon is certainly post-Ordovician, most probably post-Palaeozoic, and certainly earlier than the upper Cainozoic. It may belong to any part of the Mesozoic or Lower Cainozoic. If the dacite series be Lower

Mesozoic, we may hope to find fragments of the Dandenong dacites in the South Gippsland coal measures. If it be found that there is no trace of the dacites in these deposits then the eruptions of the Macedon-Dandenong series are probably later than the Lower Mesozoic.

At present the evidence that gives the most plausible suggestion as to the approximate age of the Macedon eruptions is the association of the dacites and the basalts.

The basalts are now divided into two groups. The Newer Volcanic Series, the Pliocene of the Geological Survey, is Upper Cainozoic, and probably lasted till the human occupation of Victoria. The Older Volcanic Series, the "Miocene" of the Geological Survey, is probably Lower Cainozoic, and according to Messrs. Hall and Pritchard may have begun in the Cretaceous.

The great dacite eruptions are probably connected with the beginning of the Older Volcanic series. Some of the rocks which Aplin mapped as Pliocene basalts belong to the group which he mapped as Palaeozoic traps. To get an independent opinion on this point I showed Mr. E. T. Prior a thin section of the rock from the quarry north-east of Woodend, telling him it was mapped by the Victorian Survey as basalt. After a brief examination he expressed the opinion that the rock was evidently related to the Macedon series and was not a basalt.

I had come to this opinion in the field, and have not yet been able to determine the line of separation between the lavas of the Macedon series and the basalts. This close field association, therefore, suggests that the two igneous series are not so remote in age from one another as was thought.

It is probable that Mount Macedon was formed at the beginning of the great series of eruptions which ended in the formation of the great basalt plains of Victoria. It is not uncommon for a great period of volcanic activity to begin with the formation of lofty piles of lava belonging to the intermediate group and to end with the discharge of broad sheets of either acid or basic rocks. The volcanic history of the Yellowstone Park furnishes a classical illustration of this sequence. As Professor Iddings (10) has shown, a long period of quiet sedimentation, which lasted through the Palaeozoic and Mesozoic,

was followed by the outburst of volcanic activity at the end of the Cretaceous. Domes of andesites—one of which, Crandall Volcano, was 13,500 feet high—were then piled up at intervals along a line 170 miles in length; then followed a short rest, during which the andesitic cones were denuded; finally came a period of fissure eruptions discharging sheets of basalt and rhyolite. The volcanic history of British East Africa shows the same general sequence, from the great dome of the kenytes to the basalts and trachytes of Laikipia and the Athi.

The volcanic history of Victoria may be found to have passed through the same stages. During the Palaeozoic there were periods of great volcanic activity, especially in the Devonian system. Then followed a long period of quiescence, succeeded, probably in the late Mesozoic or early Cainozoic, by a renewal of volcanic aetivity. Great dacite domes were formed at several centres—Macedon, Dandenong, the Cerberean Ranges, and the Blacks' Spur. After they became extinct the surrounding lowlands were devastated by the eruption of the basalts of the plains.

Hence it is not improbable that Mount Macedon is one of the volcanic piles that mark the beginning of the great period of volcanic activity, of which the last eruptions built up still existing craters, and are recorded in the legends of the Victorian aborigines.

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EXPLANATION OF PLATES XI.-XVII.

Plate XI.

Fig. 1.—Sketch map of Mount Macedon.

„ 2.—Sketch map of southern end of Upper Macedon Spur.

„ 3.—Sketch map of northern end of north-eastern buttress.

Plate XII.

Fig. 1.—Geburite-Dacite. Track to Lady Carnarvon's tree, south of the Camel's Hump. Ord. light. × 28 dia.

„ 2.—Geburite-Dacite, with broken quartz-crystal. Track to Lady Carnarvon's tree, Mount Macedon. Ord. light. × 70 dia.

Plate XIII.

Fig. 1.—Geburite-Dacite, with large hypersthene. Summit of Mount Towrong. Ord. light. × 28 dia.

„ 2.—Geburite-Dacite, from a narrow dyke on the west bank of Turritable Creek, near allotment of the late Sir F. McCoy. Ord. light. × 26 dia.

Plate XIV.

Fig. 1.—Sölvsbergite, with patches of riebeckite. The Camel's Hump. Ord. light. × 28 dia.

„ 2.—Sölvsbergite, with riebeckite, cossyrite and anorthoclase. Hanging Rock. Ord. light. × 35 dia.

Plate XV.

Fig. 1.—Geburite-Dacite. Ash from the road on west side of Turritable Creek, near allotment of late Sir F. McCoy. Ord. light. × 26 dia.

Basalt

Andesite

Solusberg

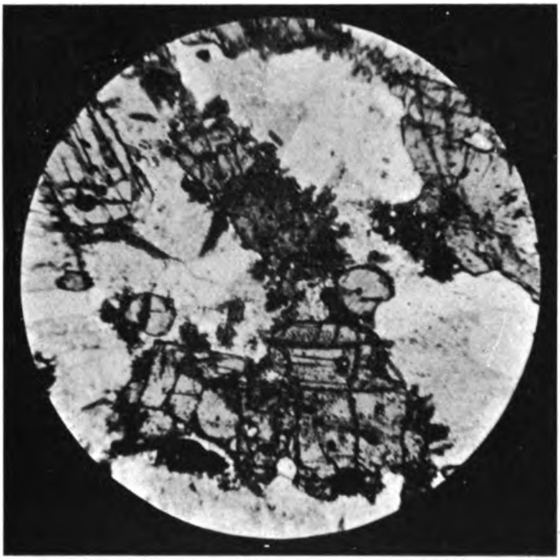
Trachy-Ph

Gaberite-D

Ordovici

Quartz-Mica-Di

Kerrie Conglom



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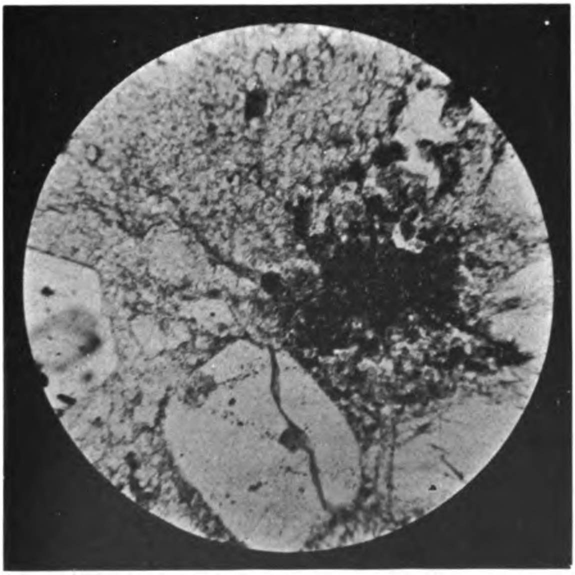
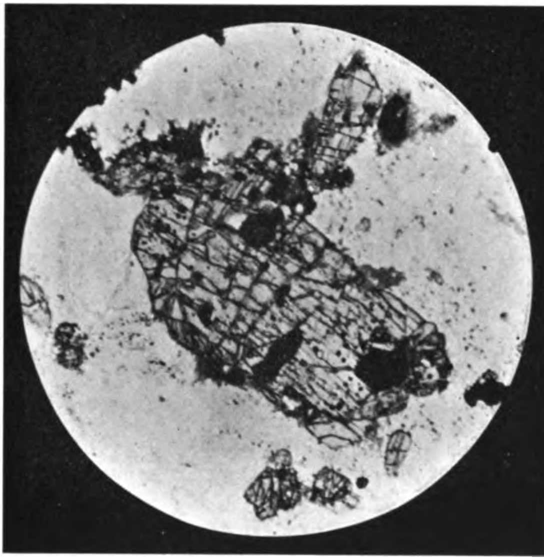


Fig. 2. H. J. Grayson, Photo.



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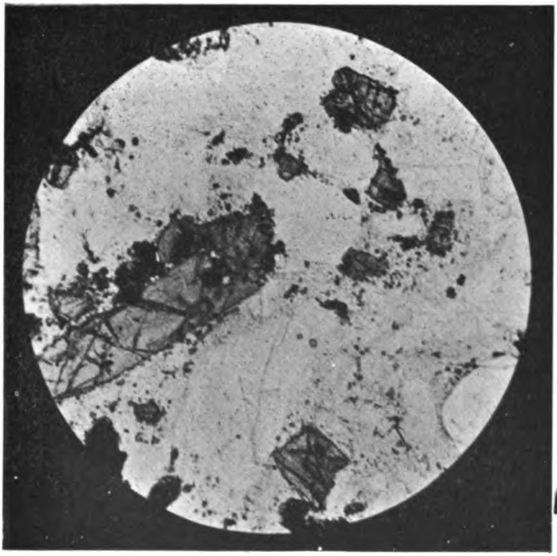

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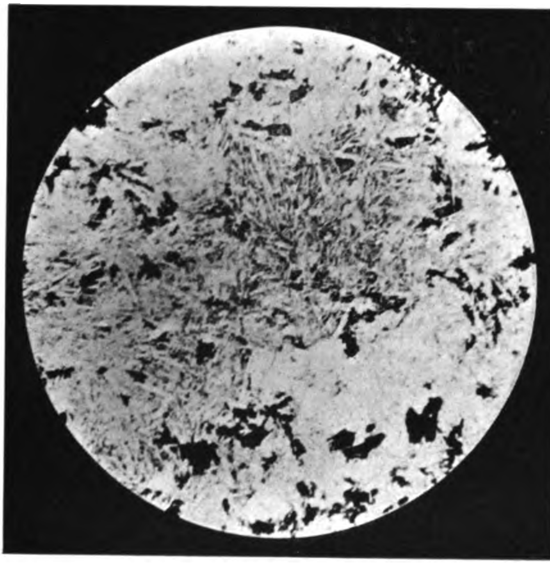

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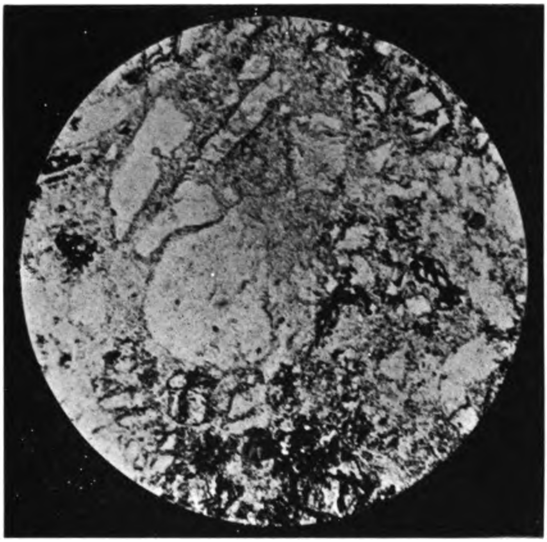

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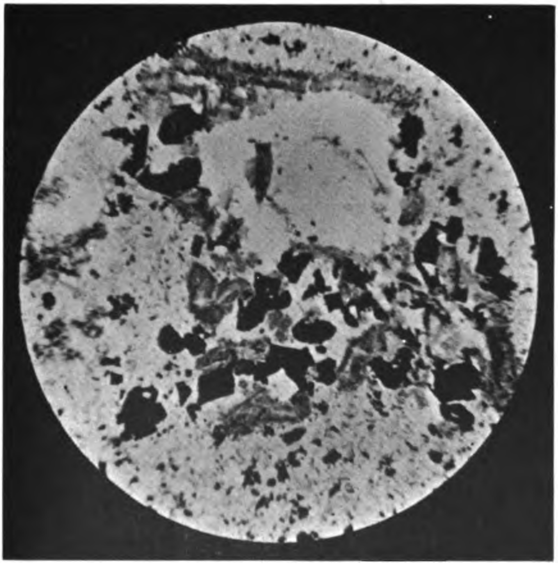
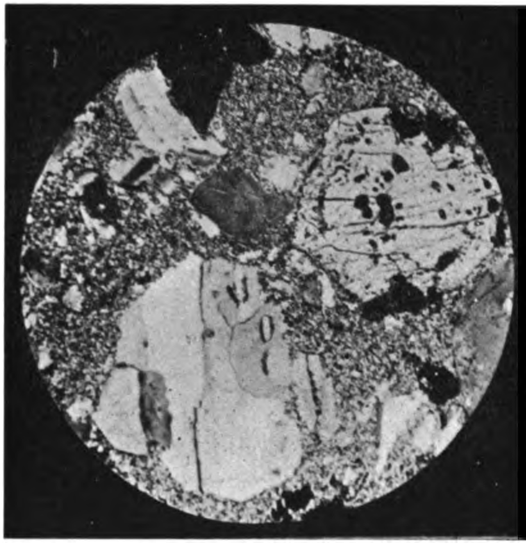


Fig 2. **H. J. Grayson, Photo.**



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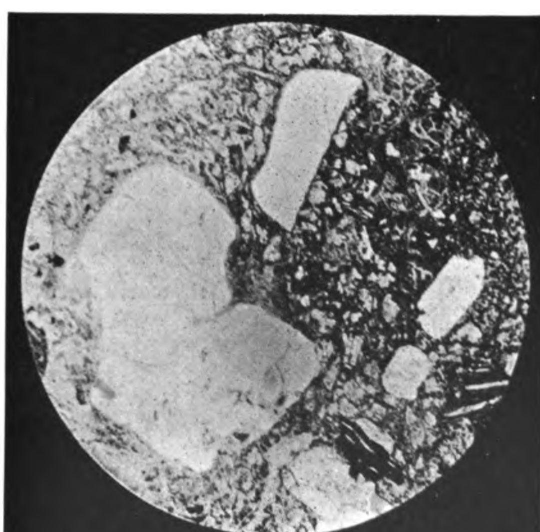

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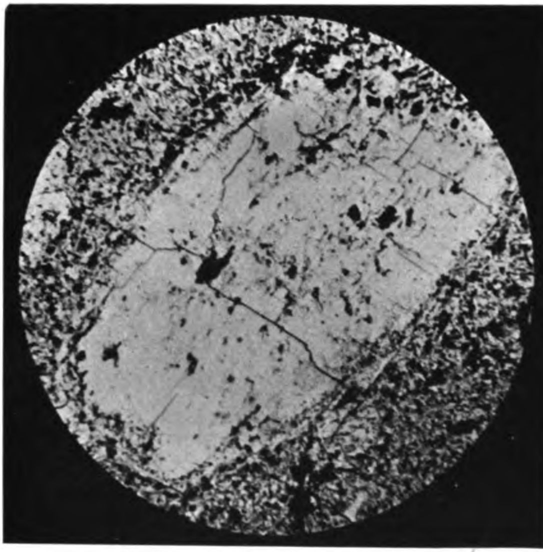

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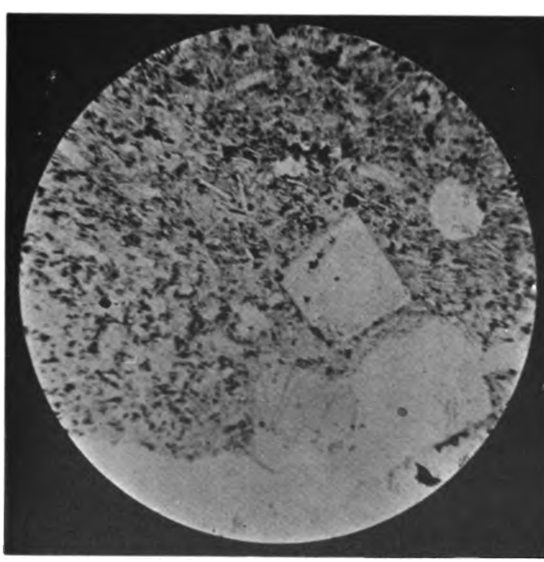


Fig. 2. H. J. Grayson, Photo.

Fig. 2.—Alkaline-andesite, with altered olivine. Quarry in north-eastern corner of parish of Woodend. Ord. light. × 28 dia.

PLATE XVI.

Fig. 1.—Hypersthene-biotite-dacite. Near the Landslip, northern face of Mount Dandenong. Crossed nicols. × 26 dia.

„ 2·—Hypersthene-biotite-dacite, with broken and corroded quartz crystal. Mount Dandenong. Ord. light. × 15 dia.

PLATE XVII.

Fig. 1.—Trachy-phonolite. Turritable Waterfall, Macedon. Ord. light. × 28 dia.

„ 2.—Sölvsbergite. Southern side of Camel's Hump. Ord. light. × 25 dia.

APPENDIX.

Specific Gravities of the Felspars of the Macedon Area.

BY H. J. GRAYSON.

1.	Geburite-Dacite	Willimigongong Creek, compact var.	3·58-2·60
2.	Trachy-phonolite	Turritable Waterfall-tuff like	2·59-2·60
3.	Andesite	Hill, North-west of Newham	2·59-2·60
4.	Sölvsbergite	Camel's Hump	2·58
5.	Geburite-Dacite	Cherokee-Roadside Boulder	2·62
6.	Sölvsbergite	South side of Camel's Hump	2·51-2·52
7.	Sölvsbergite	Hanging Rock, hard type	2·58-2·59
8.	Geburite-Dacite	Summit of Mount Towrong	2·68
9.	Trachy-phonolite	Turritable Waterfall, compact var.	2·58-2·59
10.	Sölvsbergite	Hanging Rock, soft type	2·57-2·59

The specific gravities were determined with the Thoulet solution of mercuric and potassium iodides. The crystals in the case of Nos. 1, 3, 4 and 9 were clear, compact and free foreign matter. Nos. 2, 5, 6, 7, 8 and 10 were in some instances weathered or more or less affected by impurities.

Art. XVII.—*A New Genus of Phreatoicidae.*

By O. A. SAYCE.

(With Plates XVIII., XIX.).

[Read 14th November, 1901.]

Through the kindness of Professor W. A. Haswell, of Sydney, I recently received a few specimens of a new blind Isopod of the interesting and peculiarly Australian family Phreatoicidae. They were lately received by him from Tasmania, and were found in the burrows of the land crayfish *Engaeus cunicularius*.

In all fundamental characters this new species agrees with the genus *Phreatoicus*, but has differences in degree sufficiently marked to prohibit its inclusion in that genus; nor can it be considered congeneric with either of the other two genera of this family (*Phreatoicopsis* and *Phreatoicoides*), so that it is necessary to establish another one to receive it.

The family characters are defined by Dr. Chilton, of New Zealand, as follows:—

"Body subcylindrical, more or less laterally compressed. Mandibles with a well developed appendage. Legs distinctly divided into an anterior series of four and a posterior series of three. Pleopoda broad and foliaceous and branchial in function, but not protected by an operculum. Pleon large, of six distinct segments. Uropoda, styliform."

The representatives of the family are mostly blind. Some inhabit subterranean waters, others surface waters, often on the summits of our highest mountains, and one species beside the present one is terrestrial. None are known of marine habit. They appear to be a very ancient family, and structurally widely separated from other known forms, and so far are only recorded from Australia, Tasmania, and New Zealand. It would be of interest to know if they exist in South America, for one is justified in thinking that they might be found there.

Gen. **Hypsimetopus**, gen. nov.

Generic Characters.—Very like *Phreatoicus* as to the general form of the body and the structure of the mouth-parts and several appendages. The cephalon, however, is relatively larger, being higher in front, and also deeper than the succeeding segment, to which it is freely articulated; the infero-lateral corners are produced forwards as an angular projection along the sides of the first joint of the lower antennae; the inferior margins, at about two-thirds of the length of the head from the front, curve upwards and slightly forwards to mark off on each side a large area (cheek), which, however, does not project outwards. The epistome forms a conspicuous transverse ridge below the base of the lower antennae.

First segment of pereion about as long as the succeeding segment, with its antero-lateral corners produced forwards. Pleon relatively rather shorter than in *Phreatoicus*, but not so short as in *Phreatoicoides*, the side-plates only slightly produced, and the vertically suspended pleopods almost entirely exposed.

First appendage of pereion in the male with enormous subchelate hand.

Remarks.—This new genus may easily be distinguished from *Phreatoicus* and *Phreatoicopsis* by the shape of the head, and also by the longer first segment of the trunk, with which it is very movably connected; this is not the case in the other two genera. In these characters, except in the relative length of the first segment of the trunk, it is in close agreement with *Phreatoicoides*, but, besides other differences, it fundamentally differs from that genus by the possession of an epipodite on each of the last three pairs of pleopoda, agreeing in this respect with the two first-mentioned genera. The name is suggested by the relatively high forehead in comparison with *Phreatoicus*.

Hypsimetopus intrusor, sp. nov.

Specific Characters.—Form of body rather slender, surface smooth. Eyes not formed. First four segments of pereion of subequal length. Pleon only a little deeper than the pereion, its length measuring 45 as compared with the cephalon and pereion combined as 100; terminal segment with which the telson is

amalgamated a little longer than the preceding one, narrowing somewhat distally and constricted above into a small truncated telson, which, however, does not project beyond the extremity, and is almost hidden in lateral view; this bears on its upper surface two transversely placed stout spines and many long setae; below this piece on each side is a stout marginal spine, and the margins thence curve downwards and forwards to the base of the uropoda, and are fringed by a single rather stout spine, and several spinules and setae.

The inferior margin in front of the uropoda, curves evenly upwards and bears a series of two stout and about four finer simple spines. Uropoda with rami shorter than the basal joint, inner one slightly the longer, its upper surface swollen at the middle area and bearing two stout spines, outer ramus with one spine on the upper surface.

Upper antennae not reaching to the extremity of the fourth joint of the lower antennae, peduncle short, flagellum of about seven joints. Peduncle of lower antennae long, possessing few setae, the fifth joint longer than the fourth; flagellum multi-articulate (length unknown).

Gnathopoda of male with hand very large and powerful, sub-triangular, narrow at the insertion of the finger, palm oblique, concave, margin entire, and fringed with long spineform setae, meeting the posterior border in a clearly defined obtuse angle; anterior and posterior margins evenly convex. Finger a little shorter than the palm, impinging against the inner side of the hand beyond the palmar edge, its inner surface near the middle tumified.

Colour.—Spirit specimens, creamy white.

Length.—Male, 15·5 mm.

Habitat.—Near Zeehan, Tasmania, in burrows of *Engaeus cunicularius.* (Received fron Professor W. A. Haswell.)

Supplementary Description.

I received three specimens, and each appears to be a male, in consequence of having a large hand agreeing precisely with each other. The largest one measured 15·5 mm. in length, and the other two about 12 mm.; one of these latter I dissected; it was a male, and the following description is taken from it.

Body.—The surface of the body has very few setae upon it, except the terminal segment, which possesses a fair number on the back as well as on the hind margin, which also possesses some spines and spinules. The side-plates of the pleon are fringed on the inferior and posterior margins with a few long filamentous setae, and the epimera of the last three segments of the pereion have the posterior angle of each tufted with a few spinules. The front margin of the head has also a few setae just above the base of the lower antennae, in front of the place where the eyes in allied forms are situated.

Upper Antennae.—The first three joints which form the peduncle are of subequal length, and conjointly scarcely reach beyond the second joint of the lower antennae, the basal joint is somewhat stouter than the succeeding one, the others become a little narrower. The flagellum has seven joints, and, as in *Phreatoicus*. towards the end is slightly swollen; the first joint is half the length of the preceding one (third joint of peduncle), but scarcely any narrower.

Lower Antennae.—None of the specimens possessed any that were unbroken at the ends, so that their length is unknown. The peduncle is relatively rather long and has very few setae; the first joint transverse, its lower margin longer than the upper, the second almost square, third as long as the two basal joints combined, proximally narrow and bent a little upwards, fourth a little longer, fifth considerably longer than the fourth. In the longest, but broken flagellum I counted 33 articuli.

Mouth parts.—The mouth parts are of normal form.

Anterior Lip.—Much broader than long, very thick at the base, evenly rounded distally with the centre slightly produced. Near the base of the lip (epistome) there is a distinct transverse ridge projecting outwards and thickly furred.

Mandibles.—The mandibles have no marked difference in shape from the other allied forms. The most noticeable characteristic is a rather stouter palp, the terminal joint being fully half as broad as its length. The *left* mandible has the outer cutting edge divided into four, and the inner into three teeth; between these and the molar expansion there is a secondary process (spine row) and this bears on its summit about 14 pectinated spines which are disposed in two parallel rows, which diverge from one

another on each side. The molar expansion is large and its end broad and concave.

The *right* mandible has but a single cutting edge which is divided into four teeth; between the base of this plate and the molar expansion there is a secondary process which bears a single row of about six slightly pectinated spines, and between this process and the cutting-edge there is a single stouter simple spine. The molar expansion is longer than the left-hand one, and its surface is larger and convex.

The mandibular palp has the first joint short, being as broad as it is long, the second fully three times as long, and the third fully half as broad as its length, which is less than the second; each bears many long setae, those at the apex of the terminal joint being curved, and faintly feathered.

Posterior Lip.—The posterior lip is very thick at the base, and divided into two rather broad lobes which are irregularly rounded distally and fringed with long setae.

First Maxillae.—The outer lobe of the first maxillae has the end obliquely truncated and crowded with 10 spines, some of which are more or less pectinated. The inner lobe is considerably shorter than the outer one, the end set very obliquely and clothed as follows:—A single spine at the outer extremity, at the base of which arises a long plumose setae of identical form to those so-called auditory, then follow a row of five stout setae, which are slightly curved and a little pectinated near the ends on their outer face, and ciliated along the same face lower down.

Second Maxillae.—In the allied forms, except Phreatoicopsis, there is a pretty close agreement in this organ. The present form presents no peculiarities of its own. The inner lobe is relatively long and extends to the level of the two outer twin lobes.

Maxillipedes.—These are comparatively rather slender. The epipodite is somewhat small and narrow, and the distal margin angular, with the apex rounded off. The basis, ichium, and merus are without any special differences to other forms; the plate of the basis extends to the distal extremity of the merus, and bears three curved coupling spines on the right and two on the left-hand sides. The carpus is rather long and slender, and the outer distal angle is not produced. The propodus is of equal

length to its breadth, and of almost circular outline; the dactylus is longer than the preceding joint and narrower, and the extremity rounded.

First Appendage of Pereion.—Not having seen a female I can only speak of the male form. The basis is short, being only a little longer than its greatest breadth, narrow at the neck, front margin almost straight and hind margin deeply convex. Ichium rather broader than long, posterior margin converging outwards from each end to meet in the middle length of the joint as a sharply defined angle; opposite margin convex. Merus very short, twice as wide as long; anterior margin squarely produced forward. Carpus rather narrowly jointed to the merus; hind margin convex; front margin abruptly curving outwards to form a wide union with the propodus. The remainder of the appendage has been sufficiently described.

Second, Third and Fourth Appendages of Pereion.—These agree in general shape with *Phreatoicus australis*, but do not bear nearly so many spines and setae, only the penultimate and antipenultimate joints bear any spines, and these are along the posterior margin. The last joint has beside the terminal nail a tooth on the inner margin, which agrees with each of the known members of the family, but is very small in *Phreatoicopsis*. (In my remarks following *P. shephardi*, I stated that the dactyli of the legs did not have a secondary unguis; this only applies to the three last pairs, for the second, third and fourth have a secondary nail or tooth.) The merus of the second pair is rather more expanded than the third and fourth. The fourth is shorter than the third and exhibits no sexual differentiation in the two last joints as in *Phreatoicus*.

Fifth, Sixth, and Seventh Appendages of Pereion.—These are similar to each other in form, and each succeeding pair gradually increase in length, the fifth being equal to the fourth. The dactyli of each is long with the margin entire.

Pleopoda.—These possess all the characteristics of *Phreatoicus*; relatively they are broader, and the exopodite which the last three pairs possess is larger and fringed with long setae.

First pair with protopodite narrow; exopodite twice as long as broad, jointed to protopodite near its inner margin; outer margin entire, curving upwards and outwards, then down-

wards in an even curve to the inner distal margin. Inner margin almost straight. Outer margin fringed with setae, those at the distal extremity being plumose. The inner margin is unclothed in this pair, but is thickly fringed with setae in each of the others. The endopodite is as long as the exopodite, but narrower, and except for two or three plumose setae at the extremity is unclothed. The *second pair* is of the same shape as the first pair, except that the inner margin near the end is excavated to receive a small triangular secondary joint, which is narrowly articulated close to the inner margin, and hangs only a very little below the extremity of the primary joint. The endopodite is broader than the first pair, and the "penial filament," which is borne by this joint, is short, elbowed at the base, and pointing upwards. The *third pair* is of similar length to the second, but the exopodite and epipodite are each broader, and the protopodite has a long, narrow-ovoid lobe (epipodite) jointed to its outer face. The structure of this lobe is thicker than the exopodite and very vesicular, being similar to the endopodite except that margin is fringed with long simple setae set some distance apart. The *fourth* and *fifth pairs* agree in all respects with the third, except in size, the fourth being a little shorter and the fifth much shorter, so much so as to be almost as broad as long, and the hind margin forming a full half circle.

DESCRIPTION OF PLATES.

A.—*Hypsimetopus intrusor*—Side view of the whole animal, a male of 15·5 mm.

B.—Cephalon and adjacent parts except buccal mass.

C.—Extremity of body with uropod attached.

L^1.—Anterior lip.

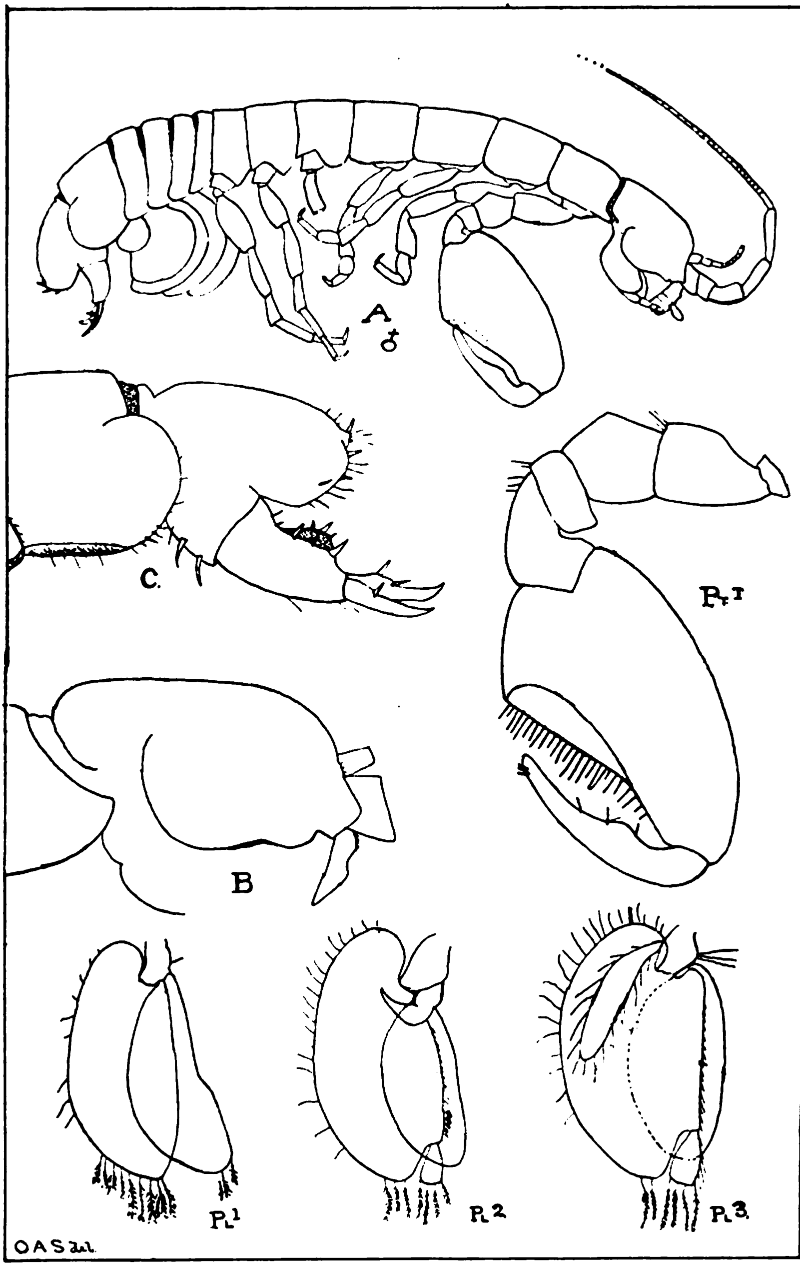
M^R and M^L.—Right and left mandibles.

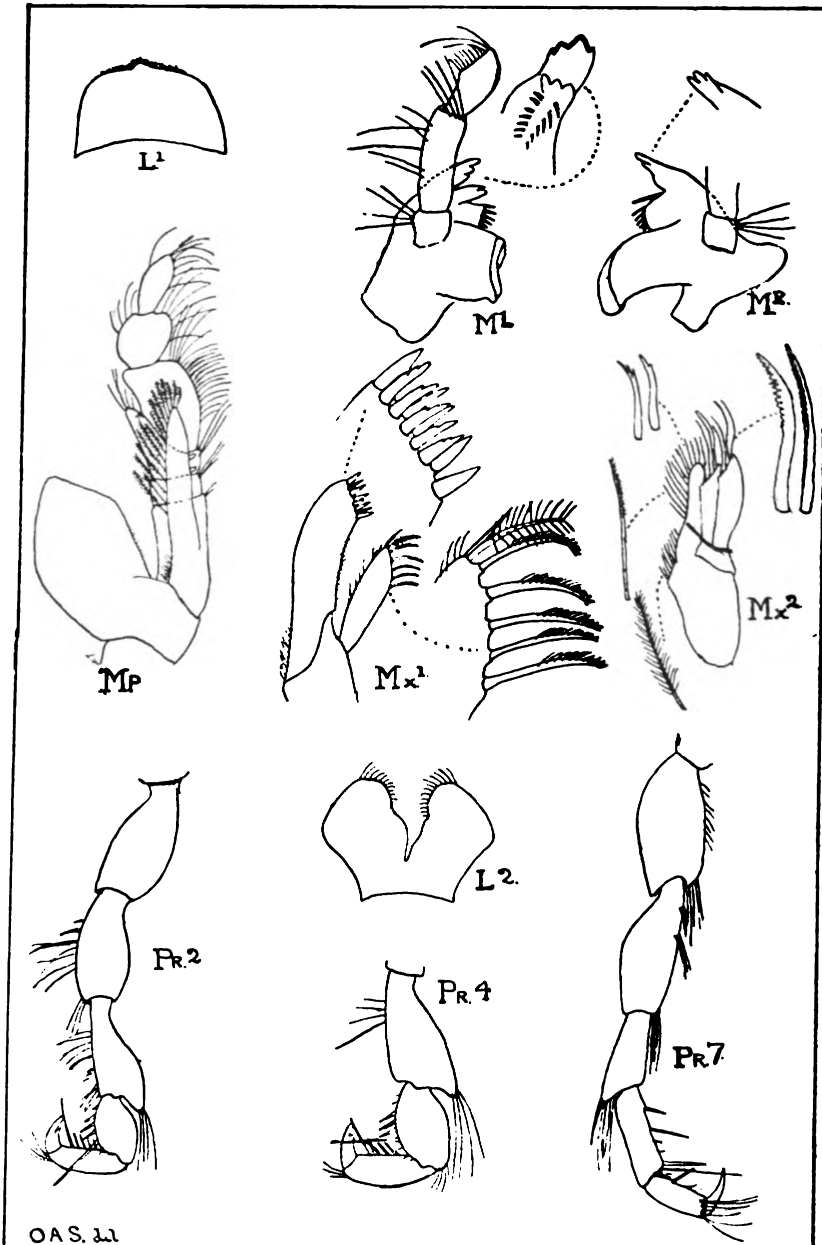
L^2.—Posterior lip.

Mx^1 and Mx^2.—First and second maxilla.

M.P.—Maxillipedes.

PR, 1, 2, 4, 7.—Pereiopods, numbered respectively.


A ♂
C.
B
P. 1
P. 2
P. 3
OAS del.


L1
M1
M2
Mp
Mx1
Mx2
L2.
Pr.2
Pr.4
Pr.7
OAS. del

ANNUAL REPORT OF THE COUNCIL

FOR THE YEAR 1900.

The Council of the Royal Society herewith presents to the Members of the Society the Annual Report and Balance Sheet for the year 1900.

The following Meetings were held:—

March 8.—*Paper:* "A contribution to our Knowledge of the Spiders of Victoria; including some New Species and Genera," by H. R. Hogg, M.A.

April 19.—*Papers:* 1. "Notes on the Plumage Changes of Petroeca phoenicea (Gould) Pachycephala gutturalis (Latham); and Microeca fascinans (Latham)," by Robert Hall. 2. "Further Descriptions of the Tertiary Polyzoa of Victoria, Part IV.," by C. M. Maplestone. 3. "Further Descriptions of Victorian Earthworms, Part I.," by Professor Baldwin Spencer. 4. "Phreatoicus shephardi, a New Genus of Fresh-water Isopoda from Victoria," by O. A. Sayce. *Exhibit:* An Aboriginal Stone Implement, by C. C. Brittlebank.

May 10.—*Papers:* 1. "Janirella, a New Genus of Isopoda from Fresh-water, Victoria," by O. A. Sayce. 2. "Hysteresis," by Professor T. R. Lyle, M.A. *Exhibits:* Rare Birds of Paradise:—Paradisornis rudolphi, Astrachia stephaniae, Amblyornis macgregori, Amblyornis subalaris, Loria loriae, by J. A. Kershaw, on behalf of the Trustees of the National Museum. Some Type Specimens of recently described Victorian Tertiary Sponges, by T. S. Hall, M.A.

June 14.—At the Natural Philosophy School, Melbourne University. *Papers:* 1. "Catalogue of the Marine Shells of Victoria, Part IV.," by G. B. Pritchard and J. H. Gatliff. 2. "On some New Species of Victorian Mollusca, No. 4," by G. B. Pritchard and J. H. Gatliff. *Lecturette:* "The Application of Crookes Tubes to Alternate Current Measurement, with

Experiments," by Professor T. R. Lyle, M.A. *Exhibits:* 1. The Wehnelt Interrupter, by Professor T. R. Lyle, M.A. 2. A New Mammal from the Older Tertiary of Tasmania, by Professor Baldwin Spencer.

July 12.—*Exhibits:* 1. Crustacea preserved by a New Process, by O. A. Sayce. 2. An Old Map of Africa, by Professor J. W. Gregory, D.Sc. Mr. White gave an account of the methods employed for determining the position of Ships at Sea.

August 9.—*Lecturette:* "The Weather," by P. Baracchi. *Exhibit:* Glaciated Stones from Ashford, N. S. Wales, by E. J. Dunn, F.G.S.

September 13.—*Papers:* 1. "Two New Victorian Frogs," by Professor Baldwin Spencer. 2. "The Reputed Cinnabar from Western Victoria," by T. S. Hart, M.A. *Lecturette:* "Some Egyptian Antiquities," by Rev. E. H. Sugden, M.A., B.Sc. *Exhibits:* 1. Egyptian Antiquities, by R. H. Walcott, on behalf of the Trustees of the Public Library. 2. The Specimen of Reputed Cinnabar from Western Victoria, which Analysis showed to be Red Lead and Oil, by T. S. Hart, M.A.

October 11.—*Papers:* 1. "A Classification of Australian Aboriginal Stone Implements," by A. S. Kenyon and D. L. Stirling. 2. "Cyphaspis spryi, a New Victorian Trilobite," by Professor J. W. Gregory, D.Sc. 3. "Note on Underground Temperatures," by H. C. Jenkins, A.R.S.M. *Exhibits:* 1. Photographs of Columnar Basalt, near Sydenham, by J. Shephard and by R. Hall. 2. A collection of about 200 Stone Implements in illustration of their paper, by A. S. Kenyon and D. L. Stirling. 3. Cyphaspis spryi, by Professor J. W. Gregory, D.Sc.

November 8.—*Paper:* "Further Descriptions of Tertiary Polyzoa from Victoria, Part V.," by C. M. Maplestone. *Lecturette with Experiments:* "High Temperature Measurements," by H. C. Jenkins, A.R.S.M.

December 13.—*Papers:* 1. "Description of some New Victorian Fresh-water Amphipoda," by O. A. Sayce. 2. "Petrological Notes on the Granites of Victoria," by E. G. Hogg, M.A. 3. "Additions and Corrections to the Census of Victorian Minerals," by R. H. Walcott, F.G.S. 4. "Geological Notes on the Yarra Improvement Works and the

Vicinity," by A. E. Kitson, F.G.S. 5. "Vittaticella, a new name for the Genus Caloporella, MacGillivray," by C. M. Maplestone.

During the year the Society has lost four members, one country member, and one associate, and gained five members and three associates.

The following publications have been issued: "Proceedings," Vol. XII., Pt. 2; Vol. XIII., Pt. I.

The Librarian reports that 1202 additions have been made to the Library during the year, and points out that additional shelving will have to be provided as the present cases are now overcrowded. Additional funds for binding are still urgently needed.

The Honorary Treasurer in Account with the Royal Society of Victoria.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from 28th February, 1900 ...	£67	7	3	By Printing and Stationery	£169	19	9
Government Grant—				Rates	5	10	0
Vote, for 1899-1900	£100	0	0	Gas and Fuel	6	3	9
1st Instalment of Vote for 1900-1901	50	0	0	Salary of Assistant-Secretary	25	0	0
Subscriptions—				Custodian	6	0	0
Members	£99	15	0	Collector's Commission	12	19	8
Country Members	11	11	6	Insurance	4	10	0
Associates	34	2	6	Postages	14	15	5
Arrears	87	3	0	Furniture and Repairs	2	5	6
Rent of Rooms	6	15	0	Books and Periodicals	3	15	6
Interest	3	15	0	Freight	4	11	0
				Refreshments	3	16	5
				Incidentals	3	16	11
				Sewerage Connections	2	3	2
				Balance (28th February, 1901) ...	195	2	2
	£460	9	3		£460	9	3

PUBLISHING AND RESEARCH FUND.

Dr.		Cr.	
To Fixed Deposit in Bank	£200 0 0	By Fixed Deposit in Bank of Australasia	200 0 0
Interest	3 15 0	Interest transferred to General Account	3 15 0
	£203 15 0		£203 15 0

Compared with the Vouchers, Bank Pass-Book and Cash-Book, and found correct,

JAMES JAMIESON,
Hon. Treasurer.

H. MOORS,
JAMES E. GILBERT, } *Auditors.*

6*th March*, 1901.

The Royal Society of Victoria.

1901.

LIST OF MEMBERS,

WITH THEIR YEAR OF JOINING.

Patron.

His Excellency Sir John Madden, K.C.M.G. 1895

Honorary Members.

Clarke, Lieut.-Gen. Sir Andrew, K.C.M.G., C.B., C.I.E., London (*President*, 1855 *to* 1857) 1854

Forrest, The Hon. Sir J., K.C.M.G., West Australia ... 1888

Hector, Sir James, K.C.M.G., M.D., F.R.S., Wellington, N.Z. 1888

Liversidge, Professor A., LL.D., F.R.S., University, Sydney, N.S.W. 1892

Neumayer, Professor George, Ph.D., Hamburg, Germany 1857

Russell, H. C., B.A., F.R.S., F.R.A.S., Observatory, Sydney, N.S.W. 1888

Scott, Rev. W., M.A., Kurrajong Heights, N.S.W. ... 1855

Selwyn, Dr., A. R. C., 1374 Broughton-street, Vancouver, B.C. 1897

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Edwards, Thomas Elford, "Kaleno," Mont Albert-road, Balwyn, Victoria 1896
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Fox, Dr. W. R., L.R.C.S., L.R.C.P., 129 St. George's-road, North Fitzroy 1899
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Gregory, Prof. J. W., D.Sc., F.R.S., University, Melbourne 1900
Grut, P. de Jersey, 160 Toorak-road, S. Yarra ... 1901

Hake, C. N., F.C.S., Melbourne Club, Melbourne ... 1890
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Harvey, J. H., A.R.V.I.A., 128 Powlett-street, East Melbourne 1895
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Hogg, E. G., M.A. 1890
Howitt, A. W., F.G.S., "Clovelly," Metung 1877

Jamieson, James, M.D., 96 Exhibition-street, Melbourne 1877
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Kernot, Professor W. C., M.A., M.C.E., University, Melbourne 1870
Kershaw, J. A., National Museum, Swanston-street ... 1900

Lyle, Professor T. R., M.A., University, Melbourne ... 1889
Loughrey, B., M.A., M.D., Ch.B., M.C.E., 3 Elgin-street, Hawthorn 1880

Martin, C. J., M.S., D.Sc., F.R.S., University, Melbourne 1897
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Ware, S., M.A., Education Department, Melbourne ...	1901
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Country Members.

Adcock, G. H., F.L.S., F.R.H.S., Gertrude-street, Geelong	1898
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Oddie, James, Dana-street, Ballarat, Victoria	1882

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Officer, Sidney, Maryvale, Edenhope 1890

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Tipping, Isaac, C.E., Ballarat, Victoria 1892

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Bailey, F. M., F.L.S., Government Botanist, Brisbane, Queensland ... 1880

Dendy, Professor Arthur, D.Sc., F.L.S., Canterbury College, Christchurch, N.Z. ... 1888

Etheridge, Robert, Junr., Australian Museum, Sydney, N.S.W. ... 1877

Howes, Professor G. B., LL.D., F.R.S., Royal College of Science, S. Kensington, England ... 1898

Lucas, A. H. S., M.A., B.Sc., Sydney Grammar School, Sydney, N.S.W. ... 1895

Stirton, James, M.D., F.L.S., 15 Newton-street, Glasgow 1880

Associates.

Adney, T. W., Arnold-street, South Yarra 1899
Aronson, L. A., Williams-road, Toorak. 1901

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Bale, W. M., F.R.M.S., Walpole-street, Hyde Park, Kew, Victoria ... 1887
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Danks, A. T., 391 Bourke-street west, Melbourne ... 1883

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Holmes, W. A., Telegraph Engineer's Office, Railway Department, Melbourne 1879

Ingamells, F. N., Observatory, Melbourne ... 1889

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Kitson, A. E., F.G.S., Mining Department, Melbourne ... 1894

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Maclean, C. W., "Bronte," Strand, Williamstown ... 1879
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Murray, Stuart, C.E., Department of Water Supply, Melbourne 1874

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Rosenhain, Walter 1896

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Shaw, Alfred C., Bond-street, Abbotsford, Victoria	...	1896
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Wedeles, James, 231 Flinders-lane, Melbourne	...	1896

INDEX.

(*The names of new genera and species are printed in Italics*).

END OF VOL. XIV.

[ISSUED APRIL, 1902.]

Printed by FORD & SON, Drummond Street, Carlton, Melbourne.

Publications of the Royal Society of Victoria, and of the Societies amalgamated with it.

VICTORIAN INSTITUTE FOR THE ADVANCEMENT OF SCIENCE.

Transactions. Vol. 1. 1855.

PHILOSOPHICAL SOCIETY OF VICTORIA.

Transactions. Vol. 1. 1855.

These two Societies then amalgamated and became:—

PHILOSOPHICAL INSTITUTE OF VICTORIA.

Transactions. Vols. 1–4.

The Society then became:—

ROYAL SOCIETY OF VICTORIA.

Transactions and Proceedings (Vol. 5, *entitled* Transactions). Vol. 5–24.

Transactions. Vol. 1, 2, 3 (part one only), 4. 1888–95.

Proceedings (New Series). Vol. 1——. 1888——.

MICROSCOPICAL SOCIETY OF VICTORIA.

Journal (Vol. 1, Pt. 1, *entitled* Quarterly Journal). Vol. 1 (Pts. 1 to 4), 2 (Pt. 1), title page and index [*all published*]. 1879–82.

[*The Society then combined with the* ROYAL SOCIETY OF VICTORIA.]

NOTE.—*Most of the volumes published before 1890 are out of print.*

Date Due